CROP EXPERIMENTS,

BOMBAY PRESIDENCY.

1890-91.

III 242

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No. 2151 of 1892.

From

E. L. CAPPEL, Esquire, C. S.,
Director, Land Records and Agriculture, Bombay;

To

The CHIEF SECRETARY to GOVERNMENT,
Revenue Department, Bombay.

Poona, 30th July 1892.

Sir,

I have the honour to submit the analysis of Crop Experiments for the year 1890-91.

2. The number of experiments reported is as follows:—

Division.	1889-90.	1890-91.			Increase or Decrease.
		Reported.	Rejected.	Total.	
Northern Division	35	30	2	32	—3
Central Division	22	20	4	24	+2
Southern Division	24	20	2	22	—2
Total ...	81	70	8	78	—3

The reasons for rejection are in each case given as usual in the analysis. The decrease in the total number of experiments is mainly attributable to the pressure of Census duties. Only one special experiment by Mr. Vádekar is reported.

3. The programme laid down by Mr. Ozanne in consultation with Collectors has been better adhered to than that of 1889-90. The marginal table shows the number of tests carried out on each staple. The ground-nut and sugarcane experiments are specially valuable and a good deal of new information has been recorded from Mr. Ajgaonkar's account of the cultivation of hill-grains in Ratnágiri. Mixed crops have also secured a fair share of attention, and the continuance of these experiments will before long solve most of the difficult problems arising from mixed cultivation. Two tests on tank numbers in Surat and a rice test in Kaira were specially asked for and are most useful. The season was unfortunately unfavourable to oilseeds and the experiments are not as valuable as they might otherwise have been. Italian millet, chillies and coriander require more attention. The general programme for 1891-92 has been laid down on the same lines as that for the year under report, as this requires supplementary experiment throughout.

Crop.	Tests.
Sugarcane	7
Oilseeds	16
Mixed crops...	11
Rice	12
Wheat	7
Harik, nágli, &c., hill-grains ..	11
Pulses	7
Cotton	3
Jowári	2
Patato	1
Maize	1
Total ...	78

4. The officers who have submitted reports specially worthy of commendation are :—

Northern Division	...	... Messrs. Weir, Batchelor, Syad Nuruddin Khán, and Orr.
Central Division...	...	... Messrs. Lucas, Vádekar, Mollison, Arthur, Doderet, and Páuse.
Southern Division	...	... Messrs. Pratt, Hudson, Kánga and Ajgaonkar.

5. The importance of these experiments has been enhanced by the recent institution of outturn returns required by the Secretary of State, and their results will gradually supplant the figures of the formulæ for all purposes. They have been criticised for the first time by Mr. Mollison, whose professional scrutiny affords an additional guarantee of value.

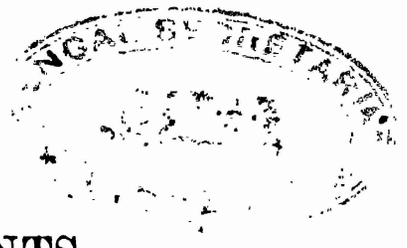
I have the honour to be,

Sir,

Your most obedient Servant,

E. L. CAPPEL,

Director, Land Records and Agriculture.



ANALYSIS OF CROP EXPERIMENTS.

NORTHERN DIVISION.

Ahmadabad.

Mr. H. O. Quin, Assistant Collector,

Sends two crop tests on irrigated rice which I have some hesitation in recording. His tabulated figures are in some instances incorrect and there are omissions. In one experiment 34 lbs. per acre is said to have been sown, in the other 18, and it is explained that it is difficult to ascertain the quantity of seed from which a rice crop has been produced.

The value of the straw is omitted. The yields of grain, respectively 1,561 and 773 lbs. per acre, are estimated locally at 14 and 13 annas, while the yields according to corresponding formulæ would be 1,840 and 1,700 lbs. per acre. As a 12-anna crop in Dholka was (1884-85) 1,386 lbs. paddy and a 10-anna one in Sánand (1885-86) 1,670 lbs., it appears that the anna estimate of the crops under test is too high, especially in Experiment No. 2. Compared with Experiment No. 1 it is not more than 6 or 7 annas. The average of rice for Daskroi was 12 annas. It is to Mr. Quin's credit that he conducted these tests notwithstanding that he held double charges for some time and was also under pressure of Census work, but the crop in Experiment No. 2 was badly selected, being far inferior to the average for the táluka.

Mr. J. K. N. Kábráji, Assistant Collector.

The outturn in this officer's cotton test is open to question on the score that the crop was only picked twice, the first time in January and again a month later. The crop appears to have been over-ripe in January. I judge of this by the weight of raw cotton then gathered, 246 lbs. per acre. This is an extraordinarily large amount for one picking. The second picking in February was not made under the supervision of the experimenter, and it is not stated whether there were any immature bolls at this time which would have ripened later on. The seed rate, 18 lbs. per acre, is double that of the formulæ.

The land was manured before sowing with five cart-loads per acre, cattle manure and refuse. The gross outturn is valued at Rs. 18-14-3, and incidence of assessment works out 9·6 per cent. Season and cultivation were good. The crop was locally estimated at 14 annas, while the general average for the táluka was 12 annas only. Cotton in this district is sold in the shell husk. The experimenter writes: "Merchants give out the pods to be opened and the work is done to a great extent by the women of every household, the remuneration being ordinarily 1¾ annas for a maund of pods." About 3 per cent. of these pods are *gogdas* or unburst bolls. These are either fed to the cattle or are beaten and an inferior quality of cotton taken out. Below I note the proportion of useful products and valueless by-products from the area experimented upon :—

Pods.		Shells.		Gogdas or unburst bolls.		Raw cotton, kapas.	
Lbs.	tolas.	Lbs.	tolas.	Lbs.	tolas.	Lbs.	tolas.
185	30	47	7	6	6	132	17

The raw cotton ginned gave 32·5 per cent. clean cotton and 67·5 per cent. seed.

Mr. G. S. Curtis, Assistant Collector.

This officer submits an experiment on red wheat, which is omitted. He says the crop was not an ave rage one, and that the field tested was not selected until

the greater part of the wheat in the district had been harvested. It is evident that the crop had been sown late ; moreover, it was injuriously affected by cold and blight, and the returns are so much under average as to be merely misleading.

Mr. E. Maconochie, Assistant Collector.

Rice, irrigated from a tank and grown on mixed black soil, is the subject of this officer's test. The assessment (water-rate included) comes to Rs. 6-4-0 per acre.

The season was favourable and the cultivation good, but the yield (987 lbs. of unhusked grain per acre) is rather disappointing. The incidence of assessment (14·02 per cent.) might be lowered by growing a second crop. The crop is much over-estimated at 16 annas if the corresponding formulæ are any guide. According to the Collector, an average rice crop in Sánand for the year is estimated at 8 annas = 975 lbs. per acre.

Kaira.

Mr. J. W. A. Weir, Assistant Collector.

Mr. Weir sends three ordinary experiments, all carefully made. Rági yielded well on land assessed at about Rs. 5 per acre, which for the last three years has been continuously cropped with mixed bájri and kodra. This season the land was manured with 10 cart-loads per acre of cowdung, ashes and sweepings, and although this is by no means a liberal dressing, it is the quantity usually applied every third year. The crop was grown from transplanted seedlings, but it is not quite clear how much the seed rate really was—presumably about 8 lbs. per acre, which is higher than usual. A ¾th guntha seed-bed was found large enough to furnish plants for one acre. 1,230 lbs. grain per acre is held to represent an average crop. The value of the gross outturn comes to Rs. 34-2-3 per acre. The weight of by-product must have been under-estimated.

Similar soil in the same village, assessed rather higher, growing kodra this season, formed the subject of Mr. Weir's second experiment (No. 6). The cropping of the three preceding years is recorded thus :—

1 Jowár ; 2 Kodra, Tur ; 3 Jowár, Math.

The seed (about 15 lbs. per acre) was drilled with a three-coulter drill in June, the land having previously been manured with 10 loads per acre ordinary manure. Considering that the season was favourable and the cultivation good, the incidence in column 11 (17·18 per cent.) appears rather high, especially as the yield reaches the bumper standard according to the formulæ.

The results obtained in the third experiment (No. 7) are more satisfactory. The tested area is rice land, assessed at a high rate, growing rice every year and irrigated from a private well. This year the cultivator tried a change of seed, viz., *jirásál* rice grown at Daskroi. This may or may not have influenced the outturn. In any case it was abundant. The incidence of assessment works out 6·44 per cent., apparently a happy result in the case of land assessed at Rs. 7-1-3 per acre, but, in the words of the experimenter, "it would be fairer to offer an opinion on this point after counting the cost of irrigation and cultivation."

The area of seed-bed per acre transplanted (2 gunthas) is probably an under-estimate.

Mr. Motilál Chunilál, District Deputy Collector.

The test area of Mr. Motilál's rági experiment is unnecessarily large. It extends to 34 gunthas and covers the whole of a survey number. The risk of inaccuracy is thus enhanced, and several errors of calculation have been corrected in this office.

A small sprinkling of kidney-bean covering $\frac{1}{17}$ of the whole area yielded badly. It was probably suppressed by the vigorous rági grown from seedlings

and planted in August. Seed at the rate of 8 lbs. per acre (an unusually high rate) was sown in a seed-bed nearly a guntha in extent. The land was manured in June by folding goats, the shepherd receiving 2 maunds of bájri and 2 maunds bávto. This means an outlay for manure of Rs. 4-11-3 per acre.

This land usually grows coarse millets, with subordinate pulse mixtures, and this season with good cultivation and sufficient rain shows a yield giving an assessment incidence of 15 per cent. The experiment is not sufficiently careful to be quite satisfactory.

Mr. Motilál furnishes a second ordinary test (No. 9) in which sesame and tur are subordinate to the principal crop, kodra. The soil (*gorádu*) is fertile and has carried during the previous three years successive crops of bájri with pulse mixture. The land was manured with nine loads per acre farmyard manure applied in June. Seed was subsequently sown in the following proportions :—

	Lbs.	tolas.	
Kodra	12	12	per acre.
Tur	4	4	do.
Sesame	0	26	do.

The resulting crop covered the ground in the following ratio :—

Kodra 5, tur 3, and sesame 2 gunthas.

It is not understood how the seed could have been drilled to produce this result. The experimenter remarks upon the careful manner in which tillage operations were conducted. The outturn is satisfactory and such as a careful cultivator might reasonably expect in a year when the rainfall was sufficient and well distributed for the crops under experiment.

Panch Maha'ls.

Messrs. A. F. Maconochie and A. F. Woodburn, Assistant Collectors.

Two ordinary experiments on consecutive crops, following each other on the same land in one year. The first experiment was made by Mr. Maconochie on the principal crop, maize; the second by Mr. Woodburn on the secondary crop, gram. The maize was manured with 11 cart-loads per acre of farmyard manure applied in May. The seed was sown in June and the crop harvested in September. Gram, as usual, unmanured, was sown in November and reaped in February.

These experiments would have been of more value, if the conditions of cultivation were ordinary. The land was, however, foul with *chida* grass, which would seriously affect the principal crop, maize, but would not be equally injurious to gram. Gram is often grown as a catch crop with the object of suppressing weeds. No safe or reliable deductions can be drawn from any experiment conducted on land stocked with weeds. At the same time we have, in the experiments commented upon, an instance of land that is assessed at a rate so low that, with indifferent cultivation, the incidence is 1·6 per cent. I attach little value to these two experiments, because the conditions were not average and because the anna estimate is also almost certainly wide of the mark. The year's rainfall was favourable to maize, the general average of which for Godhra was 14 annas, whereas the local estimate is given at 8 annas. The rainfall was less propitious for gram and the Godhra average was 4 annas; yet an estimate of 20 annas is given in the present case. However, the experiment goes to show how successfully gram can combat weeds which seriously damage other crops.

Mr. Pránlál Harkisandás, District Deputy Collector,

Submits four ordinary crop tests, affording a comparison of the returns from two fields of like character which usually each year carry a principal and an auxiliary crop. It is curious that the higher assessed land appears to be least valuable in a year of less than average rainfall.

Mr. Pránlál's first experiment (No. 12) was on a middling crop of rice, broad-casted but not transplanted. The land was fairly manured with cowdung before sowing. Mixed wheat and gram taken as a second crop was practically a

failure, because September rains were scant and the moisture left in the soil after the rice was reaped was insufficient. Moreover, slight damage was done by frost. On the gross value of produce for the year the cultivator got a return of Rs. 28-13-2 per acre, the percentage incidence of assessment being 11·04.

In the second field rice again was the principal crop and formed the subject of the 1st test (No. 14). The crop was less liberally manured than in the other field, only 3 cart-loads of cowdung per acre having been applied, and seed at a slightly higher rate was sown a fortnight earlier, 87 lbs. per acre having been broad-casted on the 3rd of July. The resulting yield is valued at Rs. 8 per acre more than in the former experiment. Both rice crops ripened at about the same time, 20th October. The difference in the returns from the two fields would be inexplicable, but for the explanation that the second field lies lower than the surrounding land. Thus the natural drainage was sufficient to maintain the rice crop in fair thriving condition until harvest. The fair yield of wheat taken as a second crop is accounted for in the same way. The gross returns for the year came to Rs. 57-10-0 and the percentage incidence of assessment works out 3·87, a very favourable result in a year of scant rainfall.

Broach.

Two ordinary tests in cotton were received from this district. Under standing orders two more ordinary tests should have been made, but the Collector explains the deficiency as due to the transfers of the officers concerned.

Mr. S. L. Batchelor, Assistant Collector.

This is an instructive experiment on cotton, intelligently worked out. The dates of picking and weights of cotton gathered at each picking are marginally noted. They contradict a common but erroneous belief that the first picking is the most important in all cases. Mr. Batchelor's explanatory notes show that the cotton might have matured over a more extended period, but early in February there were four or five nights frost which proved destructive to unripe bolls. The land was twice ploughed and manured with 12 cart-loads of cattle and goat droppings. Unless the land was foul, this is a more than ordinarily good preparation for cotton. The season was fair. 590 lbs. of crude fibre obtained per acre is a full average yield. The prices obtainable at date of experiment were low owing to a depressed state of the market, and the percentage incidence of assessment was therefore raised to 13·29. Broach is generally regarded as a highly assessed district, and this experiment supports the belief. Cotton as the staple crop, when cultivated under average conditions, ought to show a smaller percentage incidence of assessment on yield, because other crops grown in rotation with it are only indirectly profitable, taking the place of a bare fallow. The experiment is a satisfactory one, and, no doubt, entailed a considerable amount of painstaking labour.

Date.	Yield of 8 gunthas.		
	Sers.	Lbs.	
		Lbs.	tolas.
3rd January ...	13½	13	26½
8th „ ...	7½	7	27
16th „ ...	18	18	18
25th „ ...	26	26	26
30th „ ...	21	21	21
13th February ..	24½	24	37½
28th „ ...	5	5	5
Total ...	115½	118	4⅔

Messrs. Sorábsha Hormasji and Chunilál Venilál, District Deputy Collectors.

Mr. Chunilál submits one ordinary experiment on cotton, which is not altogether satisfactory. It was begun by one officer (Mr. Sorábsha) and finished by another (Mr. Chunilál), and the information conveyed must be accepted with some degree of caution. The explanatory notes are meagre. This much can be gathered that the crop on this particular area was 50 per cent. better than on the rest of the field; and, unless the experimenter wished to prove some special point, this is against standing orders. The main portion of the field appears to have been continuously cropped for years with cotton in rotation with jowár, while this particular part of it had only recently been brought under the plough.

The first picking on the 20th of January was, in point of value, the most important. It is not usual, however, to gather 57 per cent. of the whole yield at one time, which was done in this instance. Under the circumstances I must suppose that many of the bolls were over-ripe and had fallen to the ground and were lost. The experimenter says the crop was affected by cold. It would be interesting to know when the cold or frost occurred and how much the subsequent pickings were affected by it.

One item of information is valuable, viz., the percentage of clean cotton, seed and waste resulting from ginning with a hand machine.

Approximately the results were as under:—

Cottonseed	59	per cent.
Clean fibre	39	„
Waste	2	„
	100	

Ordinarily the proportion of clean cotton to cottonseed is 1 : 2.

The cotton under experiment appears to have been of superior quality.

Surat.

Notwithstanding the heavy Census work and transfers of district officers, the Collector was able to forward 10 ordinary experiments from this district, most of which are valuable. According to the programme, experiments were to be made this year (1) in lands growing sugarcane once in three or four years, (2) in lands entered in the village papers as tank numbers, (3) in lands growing double crops, viz., rice followed by vál, &c., in the same year, and (4) on castor. The experiments conducted are:—

Mr. Syad Nuruddin Khán	6	Ordinary.
„ E. Maconochie	1	sugarcane.
„ Umedrám Ranchordás	2	wheat.
„ D. N. Nánávati	1	vál.
	10	

Of the 6 experiments received from Mr. Syad Nurud Din Khán, 2 were in sugarcane, 3 on second crops, peas, vál and gram, and the last on castor. The experiments on peas and vál were specially made on tank numbers (*vide* remarks in Crop Experiment Report, 1889-90, p. 6). All these experiments, being properly conducted and exhaustively reported of, are most useful and reflect credit on the experimenter.

Mr. Syad Nur-ud-Din Khán, Assistant Collector.

It is most creditable to this officer that, in a Census year, he was able to submit a series of 6 good experiments.

This officer's sugarcane tests are most commendable. His explanatory notes are elaborate, the minutest detail of cultivation being fully and faithfully recorded. He also gives an exact account of the harvesting, cane-pressing, and gul-making processes, and adequately fulfils the main object of his experiments, which was to estimate the comparative values of two known varieties of cane. It is difficult to condense the report without omitting points of practical importance. I will, however, endeavour to explain the test in a concise form.

The two varieties tested were Khajurdi and Malbári. The first-named is a small indigenous sort. The latter is a large succulent cane of the white Mauritius kind, which flowered, a sign of robust constitution and not of maturity, to which the experimenter attributes this rather unusual occurrence. The profits per acre from the two crops may with advantage be compared, but not the weights of produce, because the one field was manured and otherwise treated differently from the other. The following statement of results will, however, be useful for record:—

Yield from five Gunthas tested.

	Khajurdi		Malbári.	
	Lbs.	tolas	Lbs.	tolas.
Number of canes cut	4,070	0	2,030	0
Weight of canes stripped and topped	9,957	29	8,089	28
Weight of tops	1,006	23	1,022	28
Weight of juice	6,855	26	5,648	17
Weight of gul	1,073	0	1,089	35
Percentage juice to cane	68 8		69 8	
Percentage gul to juice	15·6		19 2	
Percentage gul to cane	10·7		13·4	
	Ft.	in.	Ft.	in.
Average length of canes	6	11	8	9
Average circumference of canes	0	3⅛	0	3⅝
	Rs. a. p.		Rs. a. p.	
Value of canes required to replant an acre, 1,800 whole canes being used in each case	27 14 10		65 8 11	

The khajurdi test was conducted on gorádu land, assessed at Rs 12-1-11 per acre, and commanded by a well which existed before the original survey. The cropping during the previous three years is detailed thus:—

1886 sugarcane; 1887 rice and tur; 1888 rice, plantain and ginger.

The crops grown in the last-named year were rather liberally manured. During the months of April, May and June 1889, 200 cart-loads of earth from the adjoining rice land was carted to this field and carefully spread. A further pressing of ordinary manure to the extent of 30 loads per acre was applied before the monsoon. As soon as the soil was thoroughly soaked, *san* was broad-casted and allowed to grow till September, when it was ploughed in as a green manure, having meantime attained the height of 3 feet. Subsequently, the land was ploughed sixteen times and levelled with a log harrow (chowpan) eight times. The land must have been foul, to necessitate such an amount of tillage. The planting was done in November, and in the following manner according to the experimenter's description. It is accomplished "by means of the nángar. This is an appliance somewhat resembling the ordinary plough but heavier. It has, however, a tube or nozzle attachment, so arranged that the canes passed into it, while the nángar is being worked, are left imbedded in the soil at a depth of four inches or so in straight furrows made by the nángar." The field was afterwards subjected to 13 copious waterings between February and October. During the intervals between the first 8 waterings, the land was seven times thoroughly weeded, and the surface soil, when it caked hard in the sun, was loosened by means of the kudál. The canes were more or less damaged by jackals, pigs, and rats. The experimenter attempts to estimate the cost of cultivation as well as cost of harvesting and manufacturing the crop. The cultivation charges are approximate, but so much borrowed labour was used for harvesting and gul-making, that the cost could only be guessed at and therefore need not be recorded.

The experimenter does not mention the type or size of the cane-mill in use, but gives exactly the time required to express the juice from a given quantity of cane, 401 lbs. of cane, from which 68·8 per cent. juice was extracted, being passed through the mill each hour. The weight of juice required to "charge" the evaporating pan was 527 lbs. This quantity was boiled down in two hours and four minutes.

The second experiment with Malbári cane was conducted on darker soil, assessed about the same rate, and also irrigable from a well. The cane plot

extended to 1 acre and 19 gunthás. The cropping during the previous three years is stated thus :—

1886 sugarcane; 1887 rice; 1888 rice and vál.

No manure was applied directly to the sugarcane plot; but the previous rice crop sown in June 1889 was manured with ordinary farm yard manure to the extent of 66 cart-loads per acre, of which a considerable unexhausted value must have remained. The preparatory tillage consisted of six ploughings and one levelling with log harrow, all this being accomplished during the months of October and November. The cane was watered six times between February and June. Each flooding occupied ten days. In the intervals between waterings, the land, as it dried and caked, was dug and loosened with a kudál, but it was only once weeded in June, when the canes had attained the height of about 5 feet. The field was carefully watched and fenced, and the result was that the canes were not damaged to the same extent as in the first experiment. In this test 313 lbs. cane, yielding 69·8 per cent. juice, was passed through the mill in one hour. 513 lbs. juice was sufficient to charge the evaporating pan, and this quantity was boiled in two hours and thirty-nine minutes.

The comparative results financially stand thus :—

	Malbári.			Khajurdi.		
	Rs.	a.	p.	Rs.	a.	p.
Value yield per acre	591	6	0	550	4	8
Cost per acre	335	1	4	409	7	1
Net profit per acre	256	4	8	140	13	7

The Malbári crop was estimated locally at 13 annas, the khajurdi at 14 annas; and the experimenter adds the remark that sometimes worse crops are grown often better and that this season the cultivators were satisfied with the outturn. The incidence of assessment is low in both tests.

Last year a crop test submitted by this officer drew attention to a method of cultivation peculiar to the Bulsár, Chikhli and Párdi tálukas of this Collectorate, viz., the system of growing rabi crops on tank areas, which early in the season held water sufficient to irrigate the adjoining rice fields. Such land is assessed at a comparatively low rate. The information gleaned from last year's experiment was not satisfactory. Further information was deemed desirable and the present tests were undertaken to furnish it.

The tank area in the first experiment (No. 20) extends to 4 acres and 19 gunthas, the assessment being Rs. 13 per annum. The crops usually grown are peas, gram and kodra. This year the high-lying portions of the land, owing to want of moisture, were left fallow. A part was allotted to kodra, while the remainder (2 acres and 32 gunthas) was occupied by peas. The water subsided in October and the seed was then drilled, the seed rate being 40 lbs. per acre. No explicit information is offered in regard to preparatory tillage. It is not stated whether the land was ploughed or not. The resulting crop was classed locally as 12 annas, the yield, 588 lbs. per acre, being higher than in the formulæ. The Collector thinks the experimenter has estimated the value of by-products too high in this as well as the next experiment, but it must be borne in mind that both pea and vál produce excellent fodders, and command a good price at this particular season of the year when cattle food is usually scarce.

The crop was ripe at the end of January. The gross returns per acre were worth Rs. 17-9-3, the incidence of assessment, 16·5 per cent, being rather high.

For the sake of comparison another tank number was tested (Experiment No. 21). In this instance the percentage incidence of assessment is also high, but it may be noted that in both areas the cultivation was indifferent. The area of this tank is 2 acres and 8 gunthas. This year vál was the crop grown. There is nothing in the experimenter's narrative to show that the cultivation varied from that in the other test. The assessment is practically the same. The outturn was poor, only 370 lbs. per acre, which according to the formulæ represents less than half a crop.

The next test (Experiment No. 22) shows the effect of fallowing exhausted land. A poor crop of castor two years since determined the cultivator to allow the land to lie idle for a year. The crop now grown was gram. This was a wise choice, and proves that the cultivator knows that leguminous plants exercise a recuperative influence on exhausted land.

The outturn (408 lbs. per acre pulse) is estimated as a 12-anna yield. The seed, 71 lbs. per acre, was borrowed on the "dohodi" system. In preparing the field for sowing it was embanked for the retention of moisture.

I quote the following from the experimenter's notes :—

"The lands in the Párdi Táluka being mostly held by the *káli paraj* the assessment was some twenty years ago fixed at a low figure owing to the proverbial poverty of the class. They are, however, hardworking cultivators and know how to make the land most productive"

Castor grown on low-lying land, assessed at Re. 0-11-6 per acre, forms the subject of the next test (No. 23). The seed rate is much higher than common, and probably not correctly estimated. This experiment is mainly of interest, because the experimenter took the trouble to determine the percentage of oil to "khol" in expressing castor-seed. His results he details in the following tabulated form :—

Yield of 8 gunthas experimented on.						Average value per acre.	Assessment per acre.	Percentage incidence
Weight of seed.	Weight of oil	Weight of khol	Value of oil.	Value of khol	Total value.			
Lbs. t.	Lbs. t.	Lbs. t.	Rs. a. p.	Rs. a. p.	Rs. a. p	Rs. a. p.	Rs. a. p.	
91 3	35 22	49 13	4 11 0	0 5 0	5 0 0	25 0 0	0 11 6	2 87

It will be seen that there is a considerable percentage of loss in the process.

Castor cake is largely used as a manure, and for this purpose is exported from Gujarát in considerable quantities. The Poona District gets its quota principally for cane-culture. At Poona the price of "khol" is much higher than that quoted in the above table, which works out 158 lbs. per rupee, whereas at Poona 80 lbs. has the same value. The cost of transport accounts to some extent for the difference.

Mr. E. Maconochie, Assistant Collector.

Mr. Maconochie's crop experiment on sugarcane has been worked out with care, but his figures are not altogether accurate. The variety of cane was *Vánsi*, a small thin inferior sort; yet an average crop, irrigated in an intermittent manner and by no means liberally manured, gave a cash return of Rs. 311-10-6 per acre. Mr. Maconochie estimates the number of canes required to furnish sets sufficient to plant an acre at 1,777, while he gives the actual number of canes found growing on a four-guntha patch as 5,100, or 51,000 per acre. The number of canes required to furnish sets must have been under-estimated. Ordinarily an acre of average cane will replant 8 acres. Mr. Maconochie's figures show that an acre would replant 28 acres.

The percentage of juice to cane is unusually low; 70 per cent. would be nearer the mark than 49 per cent., to which the figures given work out. It may be that the crop was over-ripe. Sugarcane is usually a twelve-month crop, but fourteen months had elapsed since the one experimented with was planted. The percentage of gul to cane is only slightly under average.

It is not usual for sets to be trodden in with the foot to a depth of nine or ten inches. The following is the more common practice. Each bed, before it is planted, is flooded. The sets are laid lengthwise in the furrows and pressed down with the foot of the planter into the soft mud, but when the water subsides only a thin layer of soil, certainly not more than 2 inches in thickness, covers each set.

This experiment shows that suitable land is capable of producing a remunerative crop of sugarcane, if aided by only a moderate dressing of manure applied during the rains. The crop was planted in December.

The manure was not applied until the following August. But the previous history of the field shows that the soil might, and no doubt did, contain an unexhausted residue of manure which had been applied, annually in moderate quantity, to the three previous crops. The sugarcane, therefore, found in the soil sufficient plant-food to carry it on in a healthy condition until manure was applied eight months later.

Mr. D. N. Nánávati, District Deputy Collector.

Mr. Nánávati furnishes an experiment on vál (No. 25). It has been worked out with care, and the calculations may be accepted without hesitation. It is a common practice to grow a second crop on all rice land, but especially on such as is heavily assessed, usually vál mixed with oil-seeds in this district. In the experiment reported, vál was grown alone. The value per acre of the principal product of this crop seems to show that the cultivator gets his main profit from the auxiliary and not from the rice crop. Moreover, the cost of preparatory cultivation for the second crop is light.

Immediately after the rice is harvested one ploughing is necessary, and as the drilling of seed and the ploughing proceed simultaneously (the *orni* or seed drill being attached to the plough), only one or two subsequent turns of the harrow are required to produce a sufficiently good tilth.

All manure is applied to the land before the monsoon rains set in, and before the rice is planted. Doubtless the second crop derives some benefit, particularly if the application was a liberal one. In this test 40 cart-loads of cowdung per acre were applied. The experiment shows that 76 lbs. seed per acre, drilled in November, on land in good heart, will produce by the following March a crop of vál yielding 26½ bushels of pulse per acre, weighing 65 lbs. per bushel, valued with the useful by-products at Rs. 50-13-9 per acre.

Mr. Umedrám Ranchordás, District Deputy Collector,

Submits two wheat tests taken in two fields in different villages in the same táluka. The land of each field is of like character and similarly assessed. The conditions of season and tillage on each are alike favourable. The dates of sowing and seed rate are practically identical. The returns from the one are, however, much better than those from the other. This may fairly be attributed to the difference in the manurial condition of the land. The field that yielded best had lain waste, as grazing ground, for forty years, and has only been regularly tilled within the last five. This accounts for the productive power of the soil. Moreover it was slightly manured this season by folding sheep in June, whereas the other was unmanured.

Tha'na.

Three officers conducted experiments during the year under report in this district, viz :—

(1) Mr. R. M. Kennedy: 2 ordinary experiments in rice in Sálsette and Bassein.

(2) Mr. J. M. Cursetji : 1 ordinary experiment in nágli in Bhiwndi.

(3) Mr. J. P. Orr : 1 ordinary experiment in sweet vál in Karjat.

According to the standing orders, two more experiments, one from Mr. Orr and one from Mr. J. M. Cursetji, should have been received ; but the Collector says :—

"It has to be remembered that all officers, and particularly the First Assistant Collector, have worked under very heavy pressure this year."

Mr. R. M. Kennedy, Assistant Collector,

Made two ordinary experiments on early rice, his object being to show the value or effect of different manures. This is a question that cannot be determined by one test, nor can reliable information be gained unless the areas selected have been previously equalised. This fact, I have no doubt, was present in th

experimenter's mind when he selected the areas tested. He probably considered both soils of like character and quality; but there is nothing to show that the *condition* of the field was at all similar. The one might have been much in need of manure, the other in fairly good heart. Be this as it may, if the experiments are not valuable in the respect intended, they are otherwise of interest. With the aid of a very judicious admixture of manures, capital crops were grown in each case. The value as manure of crushed sugarcane, which is commonly burnt as fuel in the "boiling process," is well brought out.

In the first experiment (No. 28) four cart-loads of cowdung were applied in May and four maunds of fish manure in June. The season was specially good. The area selected consists of good black soil, growing rice every year. The cultivation is described as good. The crop was grown from seedlings transplanted in the end of June and raised on a rabed seed-bed, the area of which is not shown. The crop, a bumper, was harvested in October, and yielded 3,282 lbs. grain per acre, which with the by-products gave a gross value of Rs. 91-12-0 per acre. The land is assessed at Rs. 6-1-6 per acre.

In the second experiment (No. 29) the land is assessed at Rs. 4-3-4; the total value of yield per acre is Rs. 76-11-6, the weight of the principal product being 2,591 lbs. per acre. The character of season, cultivation and rotation are identical with those of the previous experiment. The manure applied differs. Two cart-loads cowdung, 1½ carts of crushed sugarcane and one cart-load of wood-ashes were applied per acre in May; 5 maunds of oil-cake were applied in July. In this case also the crop is estimated at 20 annas.

Mr. J. M. Cursetji, District Deputy Collector.

Mr. Cursetji's rági test, though accurately and carefully reported, is not a useful one and might be misleading. The crop was grown on a plot of land rented at two rupees per acre for use as a rabed seed-bed for rice. This plot forms part of a large survey number of warkas land assessed at four annas per acre. The cultivation of rági is subsidiary to that of rice seedlings, a small corner being reserved as a rági seed-bed. When the rice seedlings are removed, the rági seedlings are planted out over the whole area. The experimenter shows that a two-guntha seed-bed, rabed with 8 cart-loads of cowdung and sown with 1⅓ lbs. seed-will furnish rági seedlings sufficient for an acre. The yield (810 lbs. grain per acre) is valued at Rs. 33-4-0 per acre.

It may be noted that this land requires occasional fallowing for its special purpose. Going back five years, we find it has been used as a rice seed-bed for three, and grew in those years the following sequence of *after*-crops; 1st rági, 2nd sesame, 3rd udid; it was then allowed to lie fallow two years. I am compelled to exclude this experiment, because it is vitiated by the special character of the land. The incidence of assessment (0·75) is calculated on the average assessment of the whole number; and the inference is of course a false one.

Mr. J. P. Orr, Assistant Collector.

Great care is displayed in Mr. Orr's test on sweet vál, though he is a new experimenter. This pulse takes its usual after-crop place in a rice field. The experimenter notices that the stalks are more valuable for ráb purposes than for fodder; but the leaves and chaff are a valuable cattle-food. The yield of a secondary crop after rice is much influenced by the amount of moisture left in the soil after the principal crop has been reaped, as well as by the character of the season subsequently. These conditions seem to have been propitious in this instance, and a bumper crop was the result. 62 lbs. seed per acre (the bushel weight of the produce was 66½ lbs.), broad-casted in the middle of December, produced towards the end of the following April 1,195 lbs. pulse per acre, which with the by-products was valued at Rs. 33-5-0. This must be considered a handsome return.

CENTRAL DIVISION.

Kha'ndesh.

Only five ordinary crop experiments are received from the district conducted by—

Mr. K. R. Bomanji	...	...	...	2 ordinary.
„ W. H. Lucas	...	...	...	1 do.
„ K. Kamruddin	...	...	...	2 do.

The District Deputy Collector, Mr. Shrinivás Báláji, was able to conduct no experiment during the year under report, stating that he was prevented by the exigencies of Census work.

Mr. K. R. Bomanji, Assistant Collector,

Sends two linseed tests conducted in the Shirpur táluka. Owing to want of late rain and unseasonable sowing, the crops experimented upon were practically a failure. The experimenter forwards one sample ser to represent both his tests, believing, I suppose, that a sample ser of one linseed crop must be of equivalent weight to a sample ser of another. The weight of the sample ser recorded is not correct. The area of test in both experiments was very large, and, from his remarks, appears not to have been actually measured. The experimenter has not adhered to standing orders and his report is carelessly worked out. Both these experiments are, therefore, omitted. No useful deductions could be got from them.

Mr. W. H. Lucas, Assistant Collector.

Some interest attaches to Mr. Lucas's wheat experiment beyond that of an ordinary test. The crop was neither wholly dry nor wholly irrigated, a condition of cultivation not unusual in Khándesh when well water is available and late rains scant. The crop was flooded three times, the effect being that it matured less quickly than dry-crop wheat sown at the same time.

The yield, 890 lbs. grain per acre, classes this crop as a 13 anna one. The weight of straw only exceeded the weight of grain by 290 lbs. per acre, which proves that the crop required more moisture at some stage of its growth or that the soil lacked manure. A crop of jowári followed by a crop of cotton had been taken since the land was manured with five cart-loads per acre of cow dung in 1888.

The field is black soil, indifferently cultivated and assessed at practically Rs. 2 per acre. The incidence of assessment is comparatively low, but the extra expenses incurred in irrigation must be considered, Rs. 25, or Rs. 6¼ per acre, having been paid to a neighbour for the use of his well.

The experimenter attempts to make his test a special one by detailing the cost of cultivation per acre; but the figures can only be approximately correct. The crop is debited with ⅓rd the value of manure applied three years since. I doubt if it benefits from the unexhausted value to that extent. The experimenter puts no value against manual labour furnished by the cultivator's household. The experiment is, however, a good and careful one.

Mr. Kázi Kamruddin, District Deputy Collector.

Notwithstanding stress of revenue and census work, this officer has been able to send two well-conducted experiments on crops in regard to which special information was desired.

Sesamum, the first crop tested (No. 32), was grown on baradi land, a medium quality of soil assessed at Re. 0-7-4 per acre. The land had been lying waste two years. The area selected for experiment (20 gunthas) is more than that allowed by standing orders, but when it is known that the average produce of an acre does not usually bulk much, no objection need be taken. 12 lbs. seed per acre (double the ordinary quantity) was drilled in June. The crop was ripe in October.

The gross value amounts to Rs. 12 per acre, and local estimate makes the yield a 12-anna one. Patches of *haridli* grass occurred through the field. No manure was applied. The cultivation was middling.

The experimenter details the various tillage operations and estimates the cost of production in this as well as in his other test. The figures are from hearsay only, and need not be recorded.

Mr. Kamruddin got in his second experiment (No. 33) a slightly better yield of linseed, grown on black soil assessed at Re. 1-0-4 per acre. The crop was estimated locally at 12 annas and had a gross value of Rs. 12-4-6 per acre. The two previous crops on this land were jowári after cotton. No mention is made of any manure having been applied within the last three years. 12 lbs. seed per acre drilled in October produced a crop which was ripe in February. Both season and cultivation were average.

Nasik.

According to the programme, the crops selected for experiment in this district were niger-seed, sesame and linseed; and the experiments conducted were two in niger-seed by Mr. Deshmukh and two in linseed by Mr. Silcock. Mr. Thatte, District Deputy Collector, was relieved this year from the duty of experimenting.

Mr. H. F. Silcock, Assistant Collector,

Sends two tests on linseed. In each case the yield is disappointing. This is accounted for by the unfavourable character of the season. The experimenter attaches some interesting supplementary remarks to his tabulated figures. From these notes I extract the following:—Both crops grew on good black soil, free of weeds, and evidently well cultivated. The owners are well-to-do rayats. There was apparently very little difference as to yield in the appearance of the crops before harvest, but the best field yielded less than the poorer one. The difference is attributed to the fact that one field was sown at a more favourable time than the other. It is unusual to apply manure to these fields. If the early rain is favourable bájri is sown, otherwise jowári and linseed in rotation, and no fallows, but it depends upon the rainfall whether a kharif or rabi crop is taken. The land is ploughed three times, once deep in June and twice afterwards when some rain has fallen. It is then well harrowed and if there is not sufficient moisture for sowing, harrowing is continued apparently to allow the rain to sink well when it does come. Linseed is drilled with a three-coulter drill. The seed is harrowed in. Nothing more is done till the crop is ripe. The experimenter estimates the cost of cultivation at Rs. 5-14-8 per acre, which with three ploughings seems too low.

Mr. L. G. Deshmukh, Assistant Collector.

Two ordinary experiments on niger-seed. There is reason to suppose that the tested areas were not judiciously chosen, the experimenter himself remarking that the niger-seed harvest was nearly finished before the tests were conducted. The yields reported are suspiciously low, and, there being other elements of doubt, I am obliged to exclude these tests.

Ahmadnagar.

Mr. Sorábji Padamji, Assistant Collector,

Sends one ordinary experiment on wheat grown on dry-crop land as a second crop after bájri, but irrigated from a private well, because of scant rainfall. The crop was flooded every fifteen days.

A difference of 10 tolas in the ser of grain was found in this office as compared with the weight recorded by the experimenter. This throws some doubt upon the accuracy of the figures. Strict attention to standing orders would prevent the possibility of such discrepancies, and would have made this experiment much more trustworthy.

The explanatory notes are meagre. It is noted that westerly winds early in February occasioned "slight disease" in the crop. The nature of the disease or blight is left to conjecture. It was probably rust. Bakshi wheat grown on a red sandy loam, which was not manured and was rather foul, gave a fair yield (675 lbs. grain per acre). The fodder (straw and chaff) seems to have

been estimated rather than weighed. The figures given are evidently in round numbers. The sowing was done in November with a three-coultered drill, which was worked first lengthwise in the field and then across. This plan would ensure very equal distribution of seed. The gross returns per acre are valued at Rs. 25-7-6, which may or may not be a correct estimate. The crop was ripe on the 10th March and was weeded once—a month after sowing.

Mr. R. B. Stewart, Assistant Collector,

Sends two ordinary experiments. Jowári with safflower forms the subject of the first test. The subordinate crop practically failed for want of rain and for a similar reason the jowári yield was poor. The local estimate (14 annas) is absurd. I only include this experiment, because the crops of the district were generally below average.

Better results were got from gram (No. 38) grown as a second crop after bájri and irrigated from a well. This crop was grown on land which is assessed at Rs. 1-12-3 per acre. This includes a special water-rate. The experimenter fails to appraise the fodder value of the straw. In other respects the calculations are exact and careful.

The yield (482 lbs. pulse) makes the crop an average one. The seed, rated rather high at 76 lbs. per acre, was drilled in November. The land, heavily manured once every 3rd or 4th year, had grown the following crops during the last three years :—

1888 bájri and gram ; 1889 jowári ; and 1890 bájri and gram.

Mr. V. B. Vádekar, District Deputy Collector.

Mr. Vádekar's special test was conducted on a small holding of one field of 8 acres and 6 gunthas, assessed at Rs. 3. This is generally sufficient to maintain a hardworking family in comparative comfort. The results in the present instance bear out this belief. Looking at the previous cropping of this field, it seems that jowári with a subordinate crop mixture is grown annually. Jowári mixed with *kardai* was grown this year. The soil (*mál*) was fairly well cultivated. The land was ploughed this year, the ordinary practice being to plough once in three years. The cultivator has only one pair of work bullocks ; he borrowed a team from a well-to-do relative. This was repaid during the year by an equivalent amount of bullock labour. The land was manured with 25 loads at a cost of Rs. 5. It is unnecessary to include this in the cost of production, because about three-fifth the amount of fodder grown is consumed on the holding during 7 months of the year by the two work cattle, and the droppings from these animals, the household waste, sweepings, ashes, &c., should make a compost heap of equal value. Five rupees worth of cake was used as auxiliary food for the bullocks during the time they were being worked. The land was ploughed in April. It took fifteen days with a four-bullock plough to cover 8 acres and 6 gunthas. Subsequently, the land was harrowed four times in May, June, July and August. Each harrowing took six days. The cultivator sowed the land in two days and was assisted by his wife, a hired labourer, and four hired bullocks. There was no further tillage. The cultivator watched the crop himself and, he and his wife together harvested it.

The seed was saved from the preceding year's crop. The usual dues to village servants were paid in kind. There were other outlays, which I will detail presently. The cultivator and his wife live entirely on the produce of the land.

The season was favourable and the crop was average according to the formulæ and according to local estimate. The soil of the field was not equal throughout. Due weight was given to this by taking test areas in different parts.

The proportion of outturn available for sale or home consumption is as under : —

		Lbs.
Gross yield from whole area : jowári grain...	...	5,417
Deduct—		
Quantity given as village dues ... 163 lbs.		
Seed for next crop ... ... 32 „		195
		5,222

		Lbs.
Gross yield of *kardia* from whole area		782
Deduct—seed for next crop		8
		774
Total weight of kadbi		16,952
Deduct—Fodder for two bullocks ...	10,080 lbs.	
Village dues	512 „	
		10,592
		6,360
Chaff : total yield		3,195
Deduct—village dues		69
		3,126

We have thus available for absolute disposal :—

	Rs.	a.	p.
5,222 lbs. of jowári grain, worth at 55⅓ lbs. per rupee	94	5	11
774 lbs. safflower-seed at 43$\frac{9}{10}$ lbs.	17	10	1
6,360 lbs. kadbi at 320 lbs.	19	14	0
3,126 lbs. chaff	4	2	10
	136	0	10
Deduct—probable food for family during year, 1,080 lbs. jowári grain	19	8	4
	116	8	6

The expenses incurred during the year were :—

	Rs.	a.	p.
For clothing bought	12	14	0
For kámlis (three)	3	12	0
Oil-cake for bullocks	5	0	0
Hired labour	2	6	0
Local Fund cess	0	3	0
Government assessment	3	0	0
Condiments bought at the rate of 10 annas per month	7	8	0
Purchase of oil at 12 annas per month ...	9	0	0
Cost of a bullock to replace one lost by snake-bite, price Rs. 33 (one at this price will last, say, six years, so that the legitimate charge against this year would be Rs. 5-8-0)	33	0	0
	77	11	0

Thus after providing for the purchase of a new bullock, Government assessment and all other expenses of maintenance and cultivation, there is left a net gain of Rs. 38-13-6.

The cultivator was in debt to the extent of Rs. 150, and after paying an uxorious rate of interest, and meeting any miscellaneous expenses not calculated, he would probably just manage to avoid further indebtedness.

The experiment was well and carefully conducted by Mr. Vádekar, and is creditable to him.

Poona.

Mr. E. L. Cappel, Assistant Collector.

The crop experimented upon was potatoes, the most important garden-staple of the Khed táluka. During this season, and to a less extent during the past few years, this crop has been affected by a disease which I brought to notice during the season. This disease is forming the subject of separate enquiry, and it is only necessary to note here that it appears to be due to a new fungal pest. It is known as the *bángdi* disease, owing to the appearance of a dark ring in the tuber, on section, and the first apparent symptom is the sudden

wilting of the green top. Affected crops lose in size and weight, and in keeping qualities, many of the tubers also rotting in the ground. The disease is extending rapidly and threatens to destroy the potato crop of Poona and other districts in a few years.

The crop tested was not greatly affected by the disease. It appears that a good deep black soil, assessed at Rs. 5-4-2 per acre, growing bájri as an auxiliary crop to potatoes each year during the past four years, and watered from a private well which partially failed this year owing to deficient rainfall, is capable of growing under these unfavourable circumstances 10,940 lbs. potatoes per acre. This is locally estimated as an 8-anna yield, 16 annas being a "full average crop." A bumper crop would, therefore, yield 27,350 lbs. per acre, or above 12 tons, which in Europe would be an extraordinary outturn. The anna valuation is that of local cultivators, but is probably under-estimated. Again, it is hardly credible that 1,906 lbs. seed potatoes are required to plant an acre, particularly as each potato was divided into three or four sets, and it is likely that the information gathered is faulty on this point. If small potatoes or sets are used in planting, 900 or 1,000 lbs. per acre should be sufficient. About 22 cart-loads of cow-dung and refuse were applied as manure per acre before seed time. The seed was planted in furrows in November. The crop was ripe early in March, and lifted by means of a plough. The haulms have no marketable value and are ploughed in as manure for the succeeding bájri crop. The gross money value of the crop was Rs. 118-8-8 per acre. The percentage incidence of assessment is 4·43. It must be noticed, however, that a crop of bájri had previously been grown on the same land, the value of which, if added, would reduce the rate of incidence.

Mr. S. R. Arthur, Assistant Collector.

The two crop tests submitted by this officer are most commendable. They show strict adherence to standing orders and deserve careful analysis. The selected field of jowári carried a crop which was considered an average one of the táluka. The yield of grain (482 lbs. per acre) is not large, and when the excellence of the season is considered the anna estimate is probably too high. Very little was expended in tillage, and nothing at all in manure, and a better yield could hardly have been expected. The soil, assessed at only 5 annas per acre, varies in character, the greater portion of the field being black. The present crop followed bájri mixed with *hulga* as a subordinate crop. The land was not ploughed since last year. 3¾ lbs. seed per acre, drilled in September, is a lower seed rate than usual, and Rs. 12-0-4 is a better gross return per acre than the cultivator had any right to expect. The crop was harvested on the 19th of January. The yields of grain and kadbi were respectively 482 and 1,824 lbs. per acre.

Mr. Arthur's second test (No. 42) on groundnut loses some of its interest, because his original programme was not adhered to. His first idea was to select a field near the Níra Canal, where the quantity of water used in irrigating the field could be gauged by metre. Arrangements were not completed in time, and this opportunity was lost. More advanced cultivation is apparent in this test than in the previous one. The returns per acre, Rs. 27-13-10, although fair, are not altogether satisfactory. The land is no doubt poor. Anyway it is only assessed at Re. 0-4-4 per acre, and the percentage incidence of assessment works out 0·97. The cost of cultivating a groundnut crop, however, is considerable. The land in the present instance was once ploughed, three times harrowed and manured with 25 cart-loads of ashes, &c., per acre. Add to this the cost of seed and sowing, 76 lbs. per acre having been drilled in June; add further the cost of manual labour engaged in irrigating, and, finally, the expenses incurred in harvesting the crop; and it will be obvious that returns will hardly cover expenses unless a good crop is produced. The cost of harvesting is considerable. The process, a laborious one, consists of hand digging, gathering by hand, and ploughing, to enable the cultivator to collect any remnant left in the soil. Groundnut, however, like all leguminous crops, is a good preparation for cereals, and cultivators appreciate this fully.

Mr. J. W. Mollison, Superintendent of Farms.

Mr. Mollison's sugarcane test has been most carefully worked out and is of much interest. His note on the cultivation is printed in full in the Appendix.

Shola'pur.

The crops indicated for experiment were groundnut, khapli wheat, and linseed. Only two officers conducted experiments on these : Mr. Doderet, one ordinary on groundnut, and Mr. Fry, one on groundnut and one on jod or khapli wheat. Mr. Doderet could undertake no second experiment, having charge of the Collector's office in addition to his own. Mr. Heblikar's one test was not on a selected crop, and his explanation is, in the opinion of the Collector, unsatisfactory.

Mr. W. Doderet, Assistant Collector.

The figures of Mr. Doderet's experiment are tabulated with care and are worthy of complete analysis.

We here (No. 44) find a field, the area of which extends to 24 acres, sublet to a cultivator for Rs. 175 the Government assessment being only Rs. 26. Thus the right of ownership is worth annually about Rs. 6 per acre. No cultivator could afford to pay this amount, unless he was prepared to farm well, and unless he could command irrigation facilities to ensure a crop in any season. About 13½ acres of the field are commanded by a well.

The experimenter does not say what the cropping of the whole field was in this or any previous year, but he details the rotation pursued during the last three years on the area, 4 acres 14 gunthas, selected for experiment and under groundnut this year. In 1888-89 it grew groundnut and chillies. In 1889-90 half was under sugarcane, the other half under jowári. The land was heavily manured, 27 cart-loads worth Rs. 9 being applied per acre. The manure was carted on to the land and distributed in heaps before the first monsoon showers, but not spread until the middle of June. The land, previously ploughed in April, seems to have been carefully levelled, and after the manure was spread considerable trouble was taken to incorporate it thoroughly with the soil. 125 lbs. seed (an unusually high rate) was drilled early in July, with a 3-coulter tiphan drill. The crop was subsequently thoroughly weeded, and the advantage of careful cultivation is evidenced by a very handsome yield per acre.

The outturn (3,450 lbs. per acre of unshelled nuts) is equivalent to 2,507 lbs. of clean kernels, and is worth Rs. 81-8-2 ; add the value of fodder estimated at Rs. 5-9-2, and we have a gross return per acre of Rs. 87-1-4. This represents according to the local estimate a 17 annas or slightly over average crop. The experimenter shows approximately the cost of cultivation, and probable profits. I cannot quite follow him in all his figures, but I extract the following, and give them for what they are worth, merely remarking that some of the labour was paid and some of it household labour. The women employed in digging and harvesting the crop were paid in kind, receiving one-fourth of what they gathered each day.

	Rs.	a.	p.
Cost of tillage, including irrigation, per acre ...	37	4	0
Cost of seed	4	0	0
Cost of manure	9	0	0
Rent, average for this part of field per acre ...	7	4	10
One-fourth gross value of nuts paid for harvesting .	20	6	0
Cost of production ...	77	14	10
Value of gross produce per acre	87	1	4
Cost of production	77	14	10
Net yield ...	9	2	6

The incidence of assessment is abnormally low, but the management of the cultivator regulates this to a very material extent.

Mr. T. D. Fry, Assistant Collector,

Sends two ordinary crop experiments. Although a new experimenter, his work shows care and thoroughness, and information of a useful character has been recorded.

The area of the first test (No. 45), of groundnuts, formed at one time the bed of a nála. The land may therefore be classed as alluvial and consists of a friable brown loam, overlying a sandy subsoil, the latter 18 inches below the surface. It appears never to have been manured, but of course profits by growth of leguminous crops in rotation. This land, assessed at Re. 0-13-3 per acre, has the advantage of being near a double *mot* well built before the original survey. The crop was watered every eight days and appears to have been benefited by the late rains in November. 96 lbs. seed (without shell) was drilled per acre 3 inches deep about the middle of June. Weeding was neglected.

The yield (2,540 lbs. per acre nuts in shell) according to local estimate represents an average crop, but the Collector thinks this estimate too high. The crop was ripe in February. The shell has no value except as manure.

In the second experiment (No. 46) irrigated spelt wheat was grown as a second crop after jowári. The crop was sown late, and this was probably the reason why it was affected by mildew. The yield (915 lbs. grain per acre) was by no means bad, considering the unfavourable circumstances; but being spelt wheat, the recorded yield does not represent the weight of *clean grain*, but of grain in husk. The experimenter by actual test found the proportion of the former to the latter to be as 3 to 4. The land was manured immediately before seed time with 10 cart-loads per acre of cowdung and ashes.

Mr. B. R. Heblikar, District Deputy Collector,

Sends an experiment on rabi jowári sown in September. This test I have some hesitation in reporting. The experimenter states in his explanatory notes that kharif crops were throughout his district generally a failure, whereas rabi crops, especially jowári, were good. In this test the yield of both grain and fodder was, however, unusually small; and although the crop is said to be locally estimated as an average one, I must class it much below that level.

Sa'ta'ra.

The First Assistant Collector, Mr. Snow, was debarred from conducting any experiment this year owing to Census work and Forest Settlement duties.

Mr. G. D. Pánse, Assistant Collector,

Submits a valuable sugarcane test, with details elaborately worked out. The results show a high outturn on good garden land assessed at Rs. 3-10-2 per acre. The cultivation of sugarcane appears to be specially advanced at Peth, where the experiment was taken. The experimenter remarks that the crop selected was neither inferior nor superior to those in other fields.

The results obtained are tabulated as follows :—

	Per acre.
Number of canes'	37,326
Weight of canes (presumably with tops) ...	...lbs. 107,048
Weight of juice	... ,, 58,613
Weight of gul	... ,, 11,312
Value of gul	...Rs. 707-1-4
Estimated value as fodder of tops and residues as manure	,, 30-0-0
Estimated value of top ends of canes reserved for replanting	... ,, 20-0-0

The last item is a low estimate; about half the canes cut furnished from the small end sets suitable for replanting. This practice is economical and is gaining favour elsewhere. The crop experimented upon would have yielded per acre 18,600 sets without materially lessening the outturn of gul. If whole canes were used their value would be about Rs. 50. The crop was irrigated from a katcha well, containing at the date of experiment (January) over 12 feet of water.

Chillies, groundnut and tobacco are taken in rotation with sugarcane. The land is evidently in good heart from previous manuring, otherwise 20 loads of ordinary bullock manure applied to 1 acre 16 gunthas could not have produced a crop so heavy as the results show. The Poona 3-roller mill is used, but the native wooden mill is also employed. Mr. Pánse proves the economy of iron mills and their use will doubtless extend. The price, Rs. 125 (with freight charges, Rs. 7-8-0, added), is not prohibitive.

Mr. Pánse gives in detail, with full explanatory notes, the cost of producing the crop tested. His calculations are based upon a labourer's wage at 2 annas 6 pies per day and a pair of bullocks costing 6 annas per day to hire, except where noted :—

	Rs.	a.	p.
1. Ploughing, twice, (once crosswise)—			
Five pairs of bullocks and 4 men for two days each time and 12 annas extra for Dhuri bullocks	10	12	0
2. Manure—			
20 loads at Rs. 2 per load 40 0 0			
Cartage from Peth and spreading in field . 10 10 0			
	50	10	0
3. Levelling and preparing field for planting	2	10	0
4. Cost of 'sets' 16,000, bought at Rs. 2 per 1,000 ...	32	0	0
5. Planting—5 men employed 5 days	3	14	6
6. Repairing fence	1	0	0
7. Weeding— Rs. a. p.			
Once bullock-hoed 2 1 0			
Three times hand-weeded 8 7 0			
Digging 0 10 0			
	11	2	0
8. Watering— Rs. a. p.			
Done twice a week, 2 days each time. Four small bullocks and 2 men employed; *mot* self-discharging. One man in field; one man with bullocks: 2 men 209 days, at 2½ annas each per day 65 5 0			
Four bullocks 209 days, at 4 annas per pair per day 104 8 0			
Renewal of *mot*, ropes and contingencies ... 13 2 0			
	182	15	0
9. Harvesting and gul-making completed in 9 days— Rs. a. p.			
7 men at 2½ annas each were employed cutting the standing canes, stripping them, carrying to Gurál, and preparing cane for mill 9 13 6			
2 men passing canes through mill, at 5 annas each, for 9 days 5 10 0			
2 bullock-drivers at 2½ annas each and 8 pairs of bullocks, 9 days, at 5 annas per pair ... 25 5 0			
3 firemen for 9 days at 2½ annas each ... 4 3 6			
Professional gul-maker and assistant ... 5 14 6			
2 men for 9 days at 2½ annas each, drying for fuel expressed cane 2 13 0			
Fuel bought (crushed cane not sufficient and too wet for fuel during the first two days) . 20 0 0			
Hire of implements and utensils ... 13 8 0			
Oil for mill 0 8 0			
	87	11	6
10. Paid to Balutedárs	17	8	0
Cost of cultivation, &c., for 1 acre 16 gunthas	400	3	0

	Rs.	a.	p.
Cost per acre	285	13	7
Add—assessment	3	10	2
Net cost ...	289	7	9

The balance of income and expenditure stands thus :—

	Rs.	a.	p.
Value of gul per acre	707	1	4
Estimated value of by-product	50	0	0
Total ...	757	1	4
Cost of production per acre	289	7	9
Net profit per acre ...	467	9	7

The outturn equals that of a good crop on the deep soil near Poona, while the cost of production is much less.

Mr. Pánse tested groundnut (No. 49) in the same village. The crop was grown on first-class black soil assessed at Rs. 1-14-7 per acre and irrigated from a well. To 1¾ acres were applied 10 cart-loads of cattle manure after deep ploughing in April. 200 sheep were folded during five nights.

The season was favourable, cultivation good, and outturn satisfactory. The yield varied; one patch gave an outturn of 74 lbs. 9 tolas per guntha, another gave 88 lbs. 15 tolas per guntha, while a third gave 122 lbs. 21 tolas per gunthas

The average is 103 lbs. 4 tolas per guntha. This equals 4,124 lbs. 17⅓ tolar of nuts in shell per acre, having a money value of Rs. 103-1-9. The experimentes estimates the crop at 17 annas. Bhuimug is usually sold in the shell. The proportion of nuts in shell (shengas) to clean kernels is as 4 : 3. The seed was sown about the 7th June by two men following a two-bullock plough and dropping the seed in the furrow formed. The soil moved in forming the next furrow covered the seed. The seed rate is not quite clear; but if the cost is taken as a guide, then 41 lbs. of husked nuts per acre were used, which is a low rate The crop was ripe in January. It was bullock-hoed once, hand-weeded twice and watered twice. The value of the fodder is not estimated.

The crop was harvested by women following a plough and collecting the nuts turned up.

Mr. G. W. Scott, District Deputy Collector.

Several inaccuracies and omissions occur in this officer's groundnut test, which would have been avoided if the results had been tabulated in the usual form. Several points are left to conjecture. The weight of fodder is under estimated. A good crop of groundnut will yield much more than 788 lbs. per acre, and this product has a considerable value, though not always marketable.

Another experimenter (Mr. Doderet) values the by-products from a similar groundnut crop in Sholápur at nearly 5½ rupees per acre.

The field on which Mr. Scott's experiment was conducted is irrigable from a well, the revised survey assessment just equalling the special water-rate; both amount to Rs. 2-9-6 per acre.

The crops grown during the three previous years were bájri followed by two successive crops of jowári. The yield of principal product (3,873 lbs. per acre) is considered an average or 16-anna one. This represents the weight of nuts in shell immediately after being dug, but the experimenter should have taken the weight after the nuts were properly dry. Thus the yield as stated is higher than it ought to be One lb. (39 tolas) of unshelled nuts (shenga) gave 29½ tolas of clean kernel (dáné). The seed was drilled with a four-coulter drill in June. The seed rate (93 lbs. per acre) is above that of the formulæ. The cultivation was good. The gross outturn, if the figures are accurate, exclusive of by-products, is valued at Rs. 84-4-4 per acre, a return which reduces the percentage incidence of assessment to a low figure.

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SOUTHERN DIVISION.

Belgaum.

Only two ordinary crop experiments were received from the district, one from Mr. Sheppard and the other from Mr. DuBoulay. Two other officers, Messrs. Rand and Chitnis, report that they were debarred from conducting experiments this year by other duties. Mr. Rand's explanation is not considered satisfactory by the Collector, but Mr. Chitnis has shown reasonable cause for his failure to experiment.

Mr. W. D. Sheppard, Assistant Collector.

Mr. Sheppard's experiment on rice is useful, although the information conveyed is not correct in some details. Standing orders have not been strictly adhered to. The rotation is continuous rice as a principal crop, with pulse, either lentil or gram, as a second or cold-weather crop. The crop experimented on was drilled directly, not rábed and transplanted. The season was favourable and the land fairly manured. 27 lbs. seed, as the quantity sown per acre, is much under-estimated. At least twice that quantity would be required to produce a full crop if drilled. The date of sowing is not given.

The experiment proves that good black land fairly manured, in a favourable season with sufficient rainfall, can produce a remunerative crop of rice without transplantation. The yield points to at least fair cultivation, but the experimenter says it was indifferent, though not explaining in what respect.

Mr. J. H. DuBoulay, Assistant Collector,

Submits one ordinary experiment (No. 52), his first attempt, in sugarcane. The test is carefully conducted and reported. The variety under test was 'rasdáli,' grown in a mixed soil, manured with 50 cart-loads of cow and sheep manure and irrigated by a double *mot* from a well and adjacent nála. The yield is locally estimated at 13 annas (3,720 lbs. according to the formulæ), while the actual yield is still better and gives an acre rate of 4,847 lbs. of gul. The by-product, though useful as fodder, was not weighed by the experimenter, because it could not be sold in the local market. The approximate value of the tops is, however, recorded and included in the column of total value of produce. The rate of seed (1,500 sets per acre) is much below the mark. The price of gul per rupee in lbs. is not noted in the return as required, but the experimenter records the local rate as Rs. 15 per 8 local maunds of 52 sers of ½ pound each. This gives a rupee-rate of $13\frac{13}{16}$ lbs.

Bija'pur.

Mr. Divátia and Mr. Deshpánde have sent only one test each, accounting for the deficiency by press of Census work.

Mr. N. G. Deshpánde, District Deputy Collector,

Has expended a good deal of time and trouble on the experiment reported. He details the previous cropping of the experimented area for 5 years. This does not show any defined rotation, but it indicates that the cultivator knows the advantage of varying his crops, and the rotation is probably influenced by the character of the season.

Thus, in 1886-87 the whole field (16 acres) carried kharif crops, in 1887-88 the same area was under rabi, in 1888-89 kharif crops occupied 10 acres and rabi about 6. In 1889-90 the same proportion prevailed. This year 6 acres were sown with niger. The cropping of the other portion is not mentioned. The staple crops are jowári, bájri, cotton and niger. It is uncommon to find niger seed grown alone. The experimenter says he found several large fields growing *only* niger seed, and says the selected area carried a crop which was average for the season. The conditions of cultivation are so abnormal that the experiment is not of much value, but it may prove useful to show how unprofitable an average crop of this kind grown alone may be, when the season

is unfavourable. The land was well tilled and clean. No manure was applied. Want of rain prevented sowing until the middle of September, the usual time being a month earlier, and absence of rain later seriously affected the yield. A miserably poor return of 55 lbs. principal product per acre gives a gross money return of Rs. 1-10-3. The by-products have no marketable value. The local estimate, 7 annas, is much too high.

Mr. N. B. Divátia, Assistant Collector.

Mr. Divátia's experiment was conducted on safflower. In an 8-guntha area, 7½ gunthas was under wheat and ½ guntha under safflower. Wheat, the principal crop, was omitted, and the test was confined to the secondary crop, and that a poor one, locally estimated at 4 annas. The yield per acre is worked out to 754 lbs., value Rs. 12-15-0, showing a moderate percentage incidence of 8·49. But the test area being far below the prescribed minimum, the figures are untrustworthy and the experiment unfit for record. I have therefore excluded this experiment, which was mere wasted labour owing to disregard of standing orders.

Dha'rwa'r.

The programme settled for this district has not been followed, only one (mixed crops) out of four crops selected having been made the subject of test by the three experimenters reporting.

Mr. C. P. B. Wiltshire, Assistant Collector,

Sends two ordinary experiments. In each case the crops grown were jowári with subordinate row crops of green gram and kidney-bean. The results may, therefore, be contrasted. Barring a distinct variation in the character of the soils of the two test areas and a decided difference in the quantity of seed used, the conditions of cultivation were analogous. The season was unfavourable, the tillage good.

In the first experiment (No. 54), a black soil growing cotton and jowári in alternate years and manured with a light dressing of cowdung (only four loads per acre) yielded—

	Lbs. per acre.
Jowári	729
Gram	66
Kidney-bean	60

This land is assessed at Rs. 2-15-0 and the incidence of assessment on gross value is nearly 11 per cent.

In the second experiment (No. 55) the crop was grown from 6 lbs. jowári seed with 3 lbs. green gram and 3 lbs. kidney-bean per acre, just double the quantities sown in the other area. The soil is brown loam, assessed at Rs. 2-1-9. The experimenter hazards the explanation that this class of land requires more seed than the other, but it appears to me that an excessive quantity of seed was sown. The jowári grew so luxuriantly that the row crops were choked. Seven cart-loads of dung and fodder refuse were applied per acre in June. Both crops were sown in July and harvested at Christmas. The yield in this case was—

	Lbs. per acre.
Jowári	1,413
Gram	17
Kidney-bean	2

bearing, with the by-products, a gross value of Rs. 37-13-0. In this experiment the kadbi was valued at a lower rate than in the first, because the stalks were coarser and more woody.

Mr. R. E. Kanga, District Deputy Collector,

Forwards two carefully conducted tests on cold-weather jowári mixed with green gram in one and linseed in the other. They are interesting, as the fields selected are of the same quality and bear the same rate of assessment. Both

were carefully cultivated, the only difference being that in the second experiment no manure was in the ground, while in the first the field was manured three years ago. Field in the latter case was sown with 3½ lbs. of jowári and 6¼ lbs. of green gram per acre, while in the former 19¾ lbs. of linseed with 2⅕ lbs. of jowári was sown. In the first, which shows a good yield for jowári (more than 3 times the yield in the second), the latter probably smothered the pulse. The experimenter attributes this to irregularity of rainfall, which, he says, was sufficient in one part and deficient elsewhere in the same village. The seed rate has, however, a good deal to do with this, and the date of sowing in relation to the rainfall, as well as the manure left in the soil. Both experiments, however, were conducted and reported with care and attention to standing orders.

Mr. Sorábji Padamji, Assistant Collector.

One test on kharif jowári mixed with tur and mug in rows. The pulses being not ripe when the test on jowári was taken, Mr. Sorábji was unable to complete his report before his transfer to the Ahmadnagar District, and asked the Mámlatdár of Karajgi to furnish the necessary information on the supplementary crops tur and mug, which, however, could not be done. The experiment is carefully worked out as far as it goes, but I must exclude it as the details are open to doubt owing to the omission of the row crops.

Kolába.

Two carefully executed experiments on sweet rice by Mr. Pratt, Assistant Collector, are forwarded from the Kolába Collectorate. The District Deputy Collector, Mr. Bhángaonkar, who joined the district about the middle of March, says he was debarred from conducting any experiments owing to pressing revenue and other duties.

Mr. E. M. Pratt, Assistant Collector.

Greater interest would have attached to Mr. Pratt's tests if he had been able to carry out his original programme, viz., to complete his rice experiments and gain further information by making a test on vál, the secondary crop grown after rice in each of the fields. His transfer to another district rendered this impossible.

A parasitic grub, which infested most of the rice fields of the Alibág coast, did not do sufficient damage to vitiate results. The land that was most liberally manured suffered most. There is very little difference between the yields, and each may be classed as a bumper crop.

In the first experiment (No. 58) the crop was grown from seedlings planted out in June raised in a seed-bed which had been manured with fish, but not rábed. The ratio of seed-bed to transplanted area was in the proportion of 5½ gunthas to an acre. The land where the crop matured was not manured, but it receives drainage from the village site, which, considering that the field is very small may be all that it required. The experimenter describes the soil as deep and good and almost too rich to grow rice. This land is assessed at Rs. 6-8-10 and produced a crop which yielded 2,586 lbs. grain and 3,680 lbs. straw per acre. 70 lbs. seed per acre was sown. The rainfall was abundant.

The second experiment (No. 59) was conducted in an adjoining field, where the soil is similar and assessed at about the same rate. The returns per acre are in this case a little less. The whole field was manured with fish manure, one cart-load per acre.

The seedlings were raised in a seed-bed on which ráb of leaves, grass and cowdung had been burnt. The size of the seed-bed was in the ratio of 4⅕ gunthas to an acre transplanted. Probably the estimated damage done by the grub is too low in this case.

The percentage of incidence of assessment is not excessive (in each case about 11 per cent.).

The land grows rice continuously with a secondary pulse crop every year.

Ratna'giri.

Mr. E. McCallum, Assistant Collector.

Two experiments are reported by Mr. McCallum, First Assistant Collector. He has not adhered to standing orders, and errors have occurred in consequence in his results. The samples forwarded to this office were not correctly weighed by the experimenter, the difference between the weights recorded by him and those found in this office being too great to be accounted for by mere dryage.

This inaccuracy affects the gross weight of produce per acre, and, were it not that in other respects useful information is afforded, the experiments would be omitted.

A harik crop, estimated locally at 18 annas, gives a yield of 503 lbs., which with the by-product is worth Rs. 7-1-4.

Harik straw is valueless as fodder, but 1,703 lbs., the yield per acre in this case, is worth, for ráb purposes, more than Re. 0-6-8, which is the experimenter's estimate.

The crop in question was grown after nágli on upland level soil and was the second rotation crop after a five years' fallow, the usual practice being to complete the rotation by growing vari after harik, til after vari, and then again fallowing. The season was favourable and cultivation good. No manure was applied and the incidence of assessment on gross value works out 2·52 per cent. In considering this incidence it must be borne in mind that the land lies idle during long periods, when, as grazing land, it is not worth much. This remark applied to all warkas land.

Mr. McCallum's second experiment (No. 61) is on nágli. The seed was broad-casted in June (33 lbs. per acre) on land that had lain fallow for five years. The cropping in the previous rotation was in the following sequence: 1st nágli, 2nd vari, 3rd harik, 4th sarvati bhát (rice), followed by fallow. The yield per acre of 801 lbs. grain and 2,368 lbs. straw gives a value of Rs. 30-5-6 and an incidence of assessment of 1·18 per cent.

The experimenter estimates the total cost of cultivation per acre at Rs. 1-5-0. His figures are, however, insufficiently explained and are certainly too low.

Mr. L. N. Ajgaonkar, District Deputy Collector.

This experimenter enters into elaborate details of the cultivation of the coarse hill millets. I here analyse his narrative, extracting the facts that are of most interest and importance.

In the hill cultivation of the Konkan the main feature is the long period of fallow. If the land is good land it is left idle for at least 4 years, if of medium quality, 6 or 7 years, while, if it is poor, 10 years may elapse before it is again brought into cultivation. In the meantime such land affords grazing and grows scrub brushwood available for ráb and other purposes. When such land has sufficiently recovered, nágli usually takes the first place in rotation of cropping. On very good land nágli may follow nágli for one or two years. If the soil is medium or poor, varai occupies the land in the 2nd year, followed by harik and til in the 3rd and 4th respectively. Kulith or horse-gram is sometimes taken first.

Nágli is mostly grown from rabed seedlings. The experimenter also describes other methods of cultivation which are the exception rather than the rule. Thus he says nágli is grown in four ways :—

(1) The scrub growth on land which has long lain fallow is cut, distributed evenly over the surface and burnt. The seed is then sown broad-cast and ploughed in, or if ploughing is impracticable, the seed is covered by digging the soil with the *kudal*.

(2) Seedlings raised in a rábed seed-bed are planted out on land that has been three or four times ploughed. By the time the cultivator has the land in a fit condition for them, the seedlings are strong enough to transplant. The transplantation is managed in two ways :—

(*a*) In holes made 6 inches apart by a sharp pointed pole. The manure is applied directly to these holes. Sometimes decayed fish, mixed with ashes and sheep-dung, is used. Sometimes simply a handful of sheep or goat manure or a piece of dried fish. The seedling is inserted and the surrounding soil pressed down upon its roots.

(*b*) No manure applied. Each seedling is stuck into the soft soil, the roots being partially imbedded. This plan is only successful when there is a continued moderate rainfall. If excessive, the plants get washed away ; if there is no rain, the plants wilt and die.

(3) The seed is sown broad-cast on land that has been sufficiently tilled and manured, after lying fallow at least four years. In this case ploughing begins with the first fall of rain. It should proceed expeditiously, otherwise the crop will be late. The land is ploughed twice at least and manured with ashes or cowdung.

(4) The mode of cultivation next described is rather applicable to the preparation of the rábed seed-bed. Good land is selected or such as has been fallowed sometimes. Over the surface is evenly spread dried cowdung, then layers of lopped branch-wood (*kawal*), hay or harken (straw of harik), and finally fine sifted or pounded earth. The earth forms a layer about 2 inches thick, added in the early morning or at any time up to eight o'clock, when the dew still lies. Dew is of importance, and hence the months of March and April are selected.

The ráb heap should be fired on the afternoon of the day it is made and the earth should be burnt a dull red colour. On a seed-bed prepared in this way nágli seed is broad-casted when there are signs of monsoon rain or after the first showers. The land is then slightly ploughed and the clods broken and surface levelled with the Gutha or roller. A five-guntha seed-bed broad-casted with (practically) 12 lbs. seed furnishes sufficient seedlings to plant an acre. The crop is usually hand-weeded once late in August or early in September.

The experimenter forwards three experiments on nágli. In none of them was the crop raised from transplanted seedlings. Two of his experiments are on crops cultivated under like conditions. The season was favourable. A nearly equivalent value of manure was applied to each crop. The land in each case is assessed at about the same rate.

In the first experiment (No. 62) the cultivation is described as middling and the yield per acre (808 lbs. of grain) is about 58 per cent. of what it is in the second where the cultivation is described as good. Previous cropping has, however, to be considered.

In the 3rd experiment (No. 64) on nágli, the crop was cultivated in a different manner and it is interesting to compare results. It was the first crop taken after a five years' fallow. The whole area was rabed early in April, but in what manner is not quite clear. The probability is that what is called Kumri cultivation was adopted. The scrub growth over this area was cut, dried and burnt, possibly with the addition of other branch-wood and straw. It is hardly credible that the whole field extending to 5 acres was rabed in the manner already described for a rábed seed-bed as might be inferred from the experimenter's notes. This crop was ripe like those already referred to on 1st November and gave a yield of 1,650 lbs. grain per acre, having with the by-products a money value of Rs. 44-9-9, and showing a percentage incidence of assessment of only 0·89. Nágli requires to be stacked and kept unthreshed for some time, at least one month.

In his 4th experiment (No. 65) Mr. Ajgaonkar describes in detail the cultivation of vari. Seedlings are raised in a rábed seed-bed, 5½ lbs. of seed on a 7 guntha seed-bed furnishing sufficient seedlings to plant an acre. The land is 3 or 4 times ploughed during the first three weeks of rain. Vari usually follows nágli and is not manured, the manure applied to the preceding crop being sufficient. The crop is commonly twice weeded, once about the end of August

and again a month later. The straw of vari is not used as fodder, and as it has no other economic value except for having as ráb, the cultivator usually leaves a long stubble in reaping.

The results of this experiment and of the next, also on vari, can hardly be subjected to comparison, because the conditions of cultivation differed. In both cases the incidence of assessment on gross value is small. The first experiment shows a yield 566 lbs. grain per acre—considerably under the formulæ for a 18-anna crop. The crop was ripe on the 5th November. This was the third rotation crop taken since fallow. As regards the second vari test, the experimenter makes the remark that the crop was reduced to a 16-anna one, because the seed was sown late, but he gives no date. The returns are less favourable than in the first test, but the cultivation was poorer.

The results obtained by this officer's two experiments on harik can be contrasted with advantage. The first test was on an upland sloping land that had lain fallow for ten years. The crop in question was the third crop taken, the two previous ones being kulith followed by nágli. The cultivation is described as good. The season was, however, unfavourable. The incidence of assessment on total value of produce is low, only 4·32 per cent. The second experiment was conducted on upland level land called *bhátli* or mál land in contradistinction to the upland sloping soils which are termed *dongri*. In this case the crop experimented upon was the second crop after fallow. There is only a small difference in the assessment levied. But in this experiment the grain yield per acre was 112 lbs. better than in the other or about 17 per cent.

In the experimenter's supplementary notes some general remarks are offered on the cultivation of harik. About 61 lbs. seed is sown broad-cast per acre in third week of June. Two ploughings will suffice if the land is clean, 3 or 4 if the land is foul. No manure is applied. The crop requires one weeding only. It ripens early in November. After harvesting it is allowed to lie in the sun to dry for nearly a week, and thereafter is stacked on a *mách* (rick stool) to mature the unripe ears.

The experimenter alludes to a well-known fact that the straw of harik (sometimes the grain also) contains a poisonous principle which makes it dangerous as a food for stock.

Mr. Ajgaonkar deserves credit for his seven careful and valuable tests.

Ka'nara.

Mr. C. W. Hudson, Assistant Collector.

A good experiment on sugarcane is reported by Mr. Hudson. The crop was grown on rice land, which is also evidently well suited for sugarcane. Irrigation is provided by a stream, which runs through the area experimented upon. The assessment of Rs. 4 per acre seems low.

The details of this experiment are sensibly worked out, and afford a good deal of useful information. The experimenter does not say that the test was conducted throughout under his personal supervision. I do not, however, question his figures. They are generally in accord with authentic records of previous years. I cannot, however, accept the local estimation of the crop as correct; 14 annas is too low.

The season was favourable and facilities for irrigation were all that could be desired. The quantity of cowdung applied per acre is incorrectly stated at 102 cart-loads. The figures show 72 loads to be the right number. Leaf ash of undefined quality and quantity was also used. Altogether about 30 tons manure per acre was given. This is by no means a heavy application for sugarcane, yet the resulting crop was a capital one. The experimenter shows the gross value of gul per acre to have been Rs. 362-10-6. This does not represent the full value of gul that might have been obtained; for when the canes were topped, a piece from the top of each of the larger sized canes was cut off for replanting. This is a growing and economical practice. The sets are valued at

Rs. 2 per thousand. The experimenter calls them seed sticks and shows the proportion of canes capable of yielding them.

Total number of canes found growing on 4 gunthás ...	4,241
Number of canes that furnished seed sticks ...	3,471

The experimenter omits to value the green tops. They are not considered of great value by the cultivators. Those from an average crop will weigh, before they wilt, 8,000 to 9,000 lbs. per acre, and are commonly all consumed by the bullocks that work the cane mills. Tops are often taken as a perquisite by the owners of such bullocks when the expressing the juice and making the jagri is done by contract.

The approximate gross value of yield is shown as under :—

	Value per acre. Rs.	a.	p.
Gul 7,614 lbs. at 21 lbs. per rupee	362	10	6
34,710 sets, at 2 rupees per thousand	69	6	8
Tops	10	0	0
Total ...	442	1	2

The cane yielded 69·2 per cent. juice and 13·8 per cent. jagri.

The incidence of assessment is very low (nearly 1 per cent.). In the experimenter's explanatory notes he briefly describes the cultivation of the crop which was planted in March 1890 and took practically 11 months to mature. Very little manure was applied before planting. Dried leaves stripped from a previous crop and refuse crushed cane were spread over the surface, allowed to dry and then burnt, and a little cowdung was added. A month later, when the cane shoots were vigorous, a heavy dressing of cowdung was incorporated with the soil by digging between the rows and earthing up the cane.

In July the area was weeded and the canes wrapped. Subsequently these operations were repeated twice at intervals of a month.

Mr. Hudson's second experiment (No. 70) is on hot-weather rice in well cultivated and liberally manured garden soil. It is irrigated from a nála and grows monsoon and hot-weather rice every year. The season was good and the yield locally estimated as full average. There is no formulæ, for hot-weather rice, but according to experiments made in Kánara between 1873 and 1878 the average yield varies from 2,000 to 2,400 lbs, the acre. The actual yield in this experiment is 2,220 lbs. the acre.

The field was leased on a crop share system to a cultivator who supplied all labour and half the seed, while the landlord supplied plough-bullocks, manure and the other half of the seed. The total cultivation charges for 34 gunthás of land are :—

	Rs.	a.	p.
By *landlord*—			
Cost of a pair of bullocks for 16 days for ploughing ...	4	0	0
Do. clod-crushing	0	4	0
Do. manure, 120 cart-loads at 60 cart-loads the rupee	2	0	0
½ seed	1	4	0
Total ...	7	8	0

By the *cultivator*—

	Rs.	a.	p.
Ploughing, 1 man 16 days, at 1¼ annas per day ...	1	4	0
Clod crushing, 1 man 1 day	0	1	3
Spreading manure, 12 men 1 day, at annas 2 per day ...	1	8	0
Carried over ...	2	13	3

	Rs.	a.	p.
Brought over ...	2	13	3
Cost of half the seed (Rs. 1-4-0) and of sowing... ...	1	5	0
Transplanting	1	11	0
Annual repairs to the nála	0	6	0
Watering, 8 days of 6 hours, at 2 annas per day—1½ hours a day once in 3 days—30 watering days of 1½ hours each.	1	0	0
Reaping	0	10	0
Threshing, &c., 5 men at annas 1¼ per day—1 day ...	0	6	3
Watching	1	14	0
Cultivator's cost	10	1	6
Landlord's do.	7	8	0
Total ...	17	9	6

	Rs.	a.	p.
Value of 1,887 lbs., the yield of 34 gunthás under rice ...	34	13	2
Landlord's share	17	6	7
Deduct—Cost	7	8	0
Net produce ...	9	14	7

	Rs.	a.	p.
Cultivator's share	17	6	7
Deduct—Cost	10	1	6
Net produce ...	7	5	1

Thus the landlord, who has to pay the assessment Rs. 2-8-0 on the field, gets Rs. 7-8-0 net. The cost estimated as incurred by the cultivator represents mostly the value of labour supplied by himself and his family.

	Rs.	a.	p.
The total value of gross produce is per acre	40	15	6
Assessment...	2	15	0
Percentage incidence of assessment on gross produce ...		7·17	
Net produce after deducting the total cost, Rs. 20-11-2, per acre	20	4	4

The percentage incidence on the net produce (14·49) is not high, considering the fact that the kharif crop was left out of account.

Summary of Crop Experiment Reports,

O. S.=Original Survey;

No.	District, Ta'luka, Village and Experimenter.	Crop and date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.						Area of test.
					Seed.	Yield of		Total Value of Produce.	Assessment excluding Local Funds.	Incidence of Assessment on the value of gross Produce.	
						Principal Product.	By-product.				
1	2	3	4	5	6	7	8	9	10	11	12
	AHMADABAD.			Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.	A. G.
	Mr. H. O. Quin, Assistant Collector.										
1	Daskroi (Khokra-Mehmadabad).	Rice (Sutarsál), 31st October 1890.	14	1,840	18	1,564 (in husk.)	...	39 1 7	6 2 5 water-rate included R. S.	15·73	0 4
2	Do. (Dani Limbda) ...	Do. 5th November 1890.	13	1,700	34	773 (in husk.)	...	19 5 2	3 4 8 R. S.	17·03	0 4
	Mr. J. K. N. Kábráji, Assistant Collector.										
3	Viramgam (Viramgam) ...	Cotton, (Vágadia), 7th January and 5th February 1891.	14	370	18	371½ cotton pods.	...	18 14 3	1 13 0 R. S.	9·59	0 20
	Mr. E. Maconochie, Assistant Collector.										
4	Sánand (Mátoda)	Rice (Kamod), 25th November 1890.	16	1,950	24	987 (in husk.)	2,050	44 9 3	6 4 0 including water-rate O. S.	14·00	0 4
	KAIRA.										
	Mr. J. W. A. Weir, Assistant Collector.										
5	Ánand (Ánand)	Rági (Bávto), 25th October 1890.	16	1,650	8	1,230	900 straw, 340 bháre.	34 2 3	4 14 8 O. S.	14·40	0 8
6	Do. (do.)	Kodra, 25th October 1890.	16	1,425	15	1,993	2,400	32 0 0	5 8 0 O. S.	17·18	0 10
7	Do. (Boriávi)	Rice (Jirásál), 16th November 1890.	16	1,950	...	3,118 (in husk.)	5,000	109 12 0	7 1 3 O. S.	6·44	0 10
	Mr. Motilál Chunilál, District Deputy Collector.										
8	Mehmadabad (Areri) ...	Rági (Bávto), 21st October 1890.	10	850	8	908 bávto.	298 bari, 1,834 straw, 75 getar.	24 12 5	3 13 3 O. S.	15·06	0 34
		Kindney bean (Math), 29th January 1891.	8	15	1	15 math.		0 9 5			
								25 5 10			
9	Do. (Mehmadabad).	1 'Kodra' 9th October 1890, mixed with.	20	800	12½	985	1,304	22 8 0	4 0 0 O. S.	10·72	0 10
		2 Pigeon Pea (Tuver), 8th February 1891.	20	270	4½	265	232	6 14 0			
		3 Sesame (Tal), 9th October 1890.	19	130	¾	130	...	7 15 0			
								37 5 0			
	PANCH MAHALS.										
	Mr. A. F. Maconochie, Assistant Collector.										
10	Godhra (Gadh)	Maize, 19th September 1890.	8	560	26	825	1,650	19 1 10	0 10 4 O. S.	3·37	0 8

Northern Division, 1890-91.

R. S. = Revision Survey.

Equivalent in Tolás of local measure Ser.	Prices of Produce per Rupee. Grain.	By-product.	Remarks.
13	14	15	16
	Lbs.	Cwt.	
Weight. Ser= 40 tolás.	40	...	*Experiment No. 1* :—Light clay soil (goradu) not properly rice land, but under irrigation from a well; grows rice as a kharif crop, followed by barley in years of good rainfall. This year barley not sown, well water being required for sugarcane elsewhere. Cultivation indifferent but season fair. Manured two years ago at 20 cart-loads the acre and this year sheep allowed to graze over the land. The seed was first sown in a 5½ gunthás seed-bed at 18 lbs. the acre of transplanted area. Straw omitted in this and the following experiment. Incidence in column 11 high being on the kharif crop only, which suffered from the year's dificient rainfall.
Do.	40	...	*Experiment No. 2* :—Rice in a similar but less fertile soil irrigated from Chándoli Canal and growing rice, except in years of bad rainfall, when jowári is substituted for rice. Unmanured and badly cultivated. Season fair. The rate of seed 34 lbs. the acre high. Compared with Experiment No. I, bad cultivation and inferiority of soil is said to account for the low return.
Do.	20 cotton pods.	...	*Experiment No. 3* :—Vágadia cotton on a dry-crop, black soil, growing in alternate years, jowári and cotton. Manured before sowing in May—June at 5 cart-loads the acre of cow-dung and fodder refuse. Cultivation good and season favourable on the whole to cotton crops in the locality. Cotton under experiment sold in pods and therefore by product not accounted for.
Do.	23	11	*Experiment No. 4* :—Rice (kamod) on *besar* or mixed black soil irrigated from a tank and growing in alternate years rice and wheat. Manured at 7½ cart-loads per acre of cowdung and straw manure in June before sowing. Cultivation good and season fair. Rate of seed low for broad cast sowing compared with the formulæ seed rate. Incidence in column 11 moderate in spite of the suspiciously low yield.
Do.	46⅞	1⅞	*Experiment No. 5* :—Bávto raised from transplanted seedlings on good land locally called *Kiarinavi*. Season good and outturn good. Land manured with 10 loads cowdung and ordinary refuse; a low outturn of straw as compared with recorded weight of grain.
Do.	66½	10½	*Experiment No. 6* :—Kodra on land of like character, manured in the same manner; yielded well. The cropping during preceding three years was as follows:—(1) jowár, (2) kodra and tur, (3) jowár and math; percentage incidence of assessment seems rather high.
Do.	31¼	4½	*Experiment No. 7* :—Rather highly assessed rice-land growing rice every year. Lightly manured this year. Cultivator tried a change of seed. Yield abundant. Crop irrigated from a private well.
Do.	41 bávto. 38½ math	1 bari. 3⅝ kotar.	*Experiment No. 8* :—Rági with a small admixture of math, grown on a good soil (locally *goradu*). Manured by folding goats in June. Land usually cropped with the coarser millets and a pulse mixture, but sometimes jowár and rice grown with subordinate rows of pulse. The rági was grown from transplanted seedlings.
Do.	46¼ 51,⅝ 16¾	7¼ 1 ...	*Experiment No. 9* :—Kodra with subordinate rows of tur and sesame produced on good land in a favourable year a capital crop. The field was well cultivated and manured with 9 cart-loads per acre of farm yard manure applied in June. The seed was drilled in July. The land was cropped during the last three years with successive kharif crops of bájri and mixed pulses. Same soil as in preceding experiment.
Do.	49	6¼	*Experiment No. 10* :—Maize on an unirrigated *besar* or mixed soil growing annually maize (kharif) and gram (rabi). Manured at 11 cart-loads the acre in May. Cultivation indifferent; season fair. Land foul with '*ekida*' grass. Not a good test on this account.

Summary of Crop Experiment Reports,

O. S.=Original Survey;

No.	District, Táluka, Village and experimenter.	Crop and date of Experiment.	Local Estimate in Annas.	Yield according to Formula.	Average per Acre.						Area of test.
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.	
						Principal Product.	By-product.				
1	2	3	4	5	6	7	8	9	10	11	12
				Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.	A. g.
	PANCH MAHA'LS—*contd.*										
	Mr. A. F. Woodburn, Assistant Collector.										
11	Godhra (Gadh)	Gram (Pilachana), February 1891.	20	1,100	125	590	345	20 10 0	0 10 4 O.S.	3·17	0 8
	Mr. Pránlál Harkisandas, District Deputy Collector.										
12	Dohad (Gámla)	Rice (Sutarsál), 18th October 1890.	11	620	74½	969 (in husk.)	1,400	23 11 2	3 2 11 O.S.	13·42	0 8
13	Do. do.	Wheat (Vájia) and Gram (Rata chana), 12th March 1891.	4	210	93	128	250	3 14 0	3 2 11 O.S.	62·09	0 8
			4	90	56	51	85	1 4 0			
								5 2 0			
14	Jhálod (Nánsaláí)	Rice (Sutarsál), 20th October 1890.	13	730	87	1,364 (in husk.)	2,025	31 12 0	2 3 9 O.S.	7·03	0 4
15	Do. do.	Wheat (Vájia), 16th March 1891.	10	840	68	884	846	25 13 7	2 3 9 O.S.	8·64	0 4
	BROACH.										
	Mr. S. L. Batchelor, Assistant Collector.										
16	Jambusar (Jambusár) ...	Cotton (Deshi) 3rd January to 28th February 1891, 7 pickings.	14	370	6$\frac{9}{16}$	590 seed cotton.	...	51 0 3	6 12 0 O.S.	13·29	0 8
	Mr. Sordbsha Hormasji and Mr. Chunilál Venilál, District Deputy Collectors.										
17	Ankleshvar (Ankleshvar) ...	Cotton, 20th January to 1st March 1891, 4 pickings.	12	340	9	362 seed cotton.	...	28 5 4	4 3 9 O. S.	14·94	0 8
	SURAT.										
	Mr. Syad Nurud Din Khán, Assistant Collector.										
18	Bulsár (Abráma)	Sugarcane (Khajurdi), 4th to 6th December 1890.	14	4,260	1,800 whole canes.	8,584 gul.	22,760 tops and leaves.	550 4 8	12 1 11 Including water rate. O. S.	2·20	0 5
19	Bulsar (Párdi Haria)	Do. (Malbári), 9th to 11th December 1890.	13	3,960	1,800 do.	8,718 do.	14,456 do.	591 6 0	12 6 9 Including water rate. O. S.	2·10	0 5

Northern Division, 1890-91.—continued.

R. S. = Revision Survey.

Equivalent in Tolás of local measure Ser.	Prices of Produce per Rupee. Grain.	By-product.	Remarks.
13	14	15	16
	Lbs.	Cwts.	
Weight. Ser = 40 tolás.	30⅛	2¼	*Experiment No. 11.*—Gram following maize in the above experiment. Manured for maize, but not for gram; the *chida* grass in the field, though detrimental to maize, not so to gram. Season favourable. Rate of see high compared with the formulæ rate of 50 lbs. per acre. Percentage incidence of assessment on the year's gross produce, as shown in the two experiments 1·62. Gram sown only in one-fourth area of the field.
Do.	45¾	5	*Experiment No. 12.*—Soil, *Bhuri* or *gorâdu*, light brown growing rice, wheat and gram. Manured at 11 cart loads the acre. Cultivation fair; season unfavourable on account of failure of September rains. Compared with formulæ, yield high.
Do.	35⅜ wheat. / 45⅝ gram.	8¼ / 5¼	*Experiment No. 13.*—Wheat mixed with gram on the above soil. Not manured for the second crop. Cultivation fair; moisture left in the soil after rice taken off insufficient and crops damaged by frost. Yield there fore poor. Rate of see d high compared with the formulæ rate per acre (70 lbs. for dry-crop wheat and 50 lbs. for gram). Incidence in column 11 being on poor second crops after rice is only apparently high. Percentage incidence on year's gross produce in Experiments Nos. 12 and 13,—11·04.
Do.	49⅜ (in husk)	4½	*Experiment No. 14.*—Rice *sutarsâl* on a good *gorâdu* soil growing rice and wheat. Manured at 3 cart-loads the acre beforesowing. Cultivation good. Season unfavourable to rice crops in general on account of scanty late rains, but favourable to this crop; the field being on a lower level and consequently holding greater moisture than others in the locality.
Do.	35⅝	7⅞	*Experiment No. 15.*—Unmanured and unirrigated wheat on the same soil after rice. Cultivation good. Season fairly favouable. Compared with Experiment No. 13, yield good, and the incidence in column 11 on the second cropr, light. Percentage incidence on year's gross produce—3·87.
Do.	11½ seed cotton.	...	*Experiment No. 16.*—Indigenous cotton on a light brown soil locally called *Marugordt* growing bájri and cotton. Unirrigated but manured before sowing in June at 12 cart-loads the acre. Cultivation indifferent and season a little below average; rains slightly deficient and the crop slightly affected by cold in February. Compared with the formulæ, yield good, but rate of seed below the formulæ rate of seed per acre, 10 lbs. Proportion of seed to clean cotton not recorded.
Do.	12⅝ seed cotton.	...	*Experiment No. 17.*— Do. do. Unmanured but left fallow for 3 years. Cultivation good and season as in the above experiment. Compared with the experiment at Jambusar above, yield in column 7 low.
Weight. Ser = 37	16⅞ gul.	4¼	*Experiment No. 18*:—Sugarcane of *Khajurdi* variety on *gorâdu* soil, irrigated from a well, liberally top dressed with soil from adjoining rice land. Manured with ordinary manure 30 loads per acre before monsoon, then broad casted with hemp which was ploughed in as green manure. Cultivation good and season excellent.
Do.	15⅛ gul.	7⅜	*Experiment No. 19*:—*Malbâri* sugarcane (a variety of the Mauritius sort) yielded well considering that no manure was applied directly to the crop. The preceding rice crop was liberally manured—66 loads per acre having been applied. The land was well tilled and season favourable.

Summary of Crop Experiment Reports,

O. S. = Original Survey;

No.	District, Tálukа, Village and Experimenter.	Crop and date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.						Area of test.
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.	
						Principal Product.	By-product.				
1	2	3	4	5	6	7	8	9	10	11	12
	SURAT.—*continued.*			Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.	A.
	Mr. Syad Nurud Din Khan, Assistant Collector—contd.										
20	Bulsár (Sonváda)	Peas (Vatána), 30th January 1891.	12	480	40¾	588	768	17 9 3	2 14 6 O. S.	16·53	0 8
21	Do. do.	Vál (Kadva), 4th March 1891.	10 to 12	450 to 530	58	370	811	15 0 0	2 12 3 O. S.	18·43	0 8
22	Párdi (Dungra)	Gram, 18th February 1891.	12	480	71	408	142	13 12 0	0 11 0 O. S.	5·00	0 8
23	Do. (Karáya)	Castor (Diveli), 21st February 1891.	12 to 14	340 to 390	43¾	455	...	17 15 11	0 11 5 O. S.	3·99	0 8
	Mr. E. Maconochie, Assistant Collector.										
24	Jalálpor (Hansápur)	Sugarcane (Vánsi), 3rd February 1891.	16	5,250	1,777 whole canes.	5,230 gul.	6,480 green tops.	311 10 6	14 10 9 water-rate included. O. S.	4·52	0 4
	Mr. D. N. Nánávati, District Deputy Collector.										
25	Chorási (Kapletha)	Vál, 14th March 1891.	16	675	76½	1,732	2,070 chaff 1,605 stalks.	50 13 9	10 5 10 O. S. with water-rate. 19 0 4 O. S.	20·37 37·39	0 4
	Mr. Umedrám Ranchordas, District Deputy Collector.										
26	Bárdoli (Suniva)	Wheat (Hánsia), 16th February 1891.	12	730	66	1,129	1,433	45 3 9	3 14 6 O. S.	8·63	0 8
27	Do. (Bharampur)	Do.	8	490	66	669	645	25 11 3	3 12 7 O. S.	14·73	0 8
	THANA.										
	Mr. R. M. Kennedy, Assistant Collector.										
28	Sálsette (Dánda)	Rice (Garve, Durku) 22nd October 1890.	20	2,000	30	3,282 (in husk).	7,545	91 12 0	6 1 6 O. S.	6·64	0 8
29	Bassein (Mulgaon)	Salt rice (Kudruk), 25th October 1890.	20	1,500	36	2,591 (in husk).	3,675	76 11 6	4 3 4 O. S.	5·48	0 8
	Mr. J. P. Orr, Assistant Collector.										
30	Karjat (Kaloti Ryati Khálápur Peta).	Sweet Vál, 25th April 1890.	20	400	62	1,195	870 chaff 1,334 stalks.	33 5 0	6 1 10 R. S.	18·35	0 9

Northern Division, 1890-91—continued.

R. S. = Revision Survey.

Equivalent in Tolás of local measure Ser.	Prices of Produce per Rupee.		Remarks.
	Grain.	By-product.	
13	14	15	16
	Lbs.	Cwts.	
Weight ser =37 Tolás.	46½	1¾	*Experiment No. 20.*—Peas grown as a late rabi crop on a tank number which early in season held water sufficient for irrigating adjoining land. When the water subsided the peas were sown. This land is principally cropped with peas; but kodra, castors and gram, are occasionally grown. The season was favourable, but the cultivation indifferent.
Do. ...	37	1½	*Experiment No. 21.*—Vál grown under similar conditions to last test. Yield poor and incidence of assessment high; for each of which results indifferent cultivation is partly accountable.
Do. ...	$30\frac{5}{13}$	4	*Experiment No. 22.*—Gram sown after a year's fallow on black soil previously exhausted, but which grows usually castors once in two years. Season favourable. Cultivation good and outturn fair.
Do. ...	25⅞	...	*Experiment No. 23.*—Black soil growing castors as a secondary crop to rice. With indifferent cultivation and a good season the incidence in column 11 is apparently too low.
Do. 37½	18	2¼	*Experiment No. 24.*—Sugarcane on a black clay soil irrigated from a well and tank, and growing rice as *kharif* and vál as *rabi* crop for 3 continuous years followed by sugarcane in the 4th. Manured with cowdung every year before the rains for rice at 4½ cart-loads the acre, and for sugarcane after planting with oil-cake at 29 local mds. or 1,115 lbs. the acre. Cultivation good and season only average as failure of late rains and consequent early drying of the tank caused the canes to be smaller than they would otherwise have been.
Do. 37½	57	1 chaff 5½ stalks.	*Experiment No. 25.*—Vál on a black soil usually growing rice as kharif and irrigated from a neighbouring well. Rotation every year rice followed by vál and oil-seeds. Manured for rice at 40 cart-loads the acre before the commencement of the monsoon. Cultivation good and season favourable to vál, which required no irrigation. Compared with the formulæ (40 lbs. the acre) the rate of seed in column 6 high. Figures reported as returned. Percentage incidence in column 11 high being on rabi crop only.
Do. 37	30	$1\frac{11}{16}$	*Experiment No. 26.*—Black soil locally called *Morwan* and cropped with wheat, gave good returns. It has only been regularly tilled within the last 5 years; previously it was waste or grazing land. The effect of long fallow is observed. This land grows cotton, wheat and jowár.
Do. 37	30	$1\frac{11}{16}$	*Experiment No. 27.*—Wheat on similarly classed soil did not yield so well as in the last test (No. 26) although the conditions of tillage and season were very much alike for both fields. Lack of manure accounts for high percentage of incidence in this experiment.
72⅞	$44\frac{1}{10}$	$3\frac{9}{10}$	*Experiment No. 28.*—A good black soil growing rice every year. Judiciously manured in May with 4 cart-loads cow-dung per acre and in July with 4 maunds fish manure. Good cultivation coupled with a favourable season tended to produce a bumper crop.
52⅞	38½	3¼	*Experiment No. 29.*—Salt rice on black coast land also yielded well, though rather differently manured. To this crop there was applied in May 2 cart-loads of farm-yard manure, 1½ cart-loads crushed cane, and 1 load of ashes per acre, and to the same area in July 5 maunds of oil-cake.
76	39½	7½	*Experiment No. 30.*—Reddish soil (garwi) growing rice followed by vál every year. Neither manured nor irrigated. Cultivation good, and season excellent for vál. Compared with the formulæ, yield high; incidence in column 11 is on the second crop only.

Summary of Crop Experiment Reports,

O. S. = Original Survey;

No.	District, Ta'luka, village and Experimenter.	Crop and date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.						Area of test.
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.	
						Principal Product.	By-product.				
1	2	3	4	5	6	7	8	9	10	11	12
	KHÁNDESH.			Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.	A. g.
	Mr. W. H. Lucas, Assistant Collector.										
31	Sáwda (Sáwda)	Wheat (Bansi) irrigated. 5th February 1891.	10	420	58½	889	1,176	34 14 0	1 15 9 R. S.	5·69	0 10
	Mr. Kazi Kamruddin, District Deputy Collector.										
32	Dhulia (Narval)	Sesame (Til) 8th October 1890.	12	350	12	210 seed.	...	12 0 0	0 7 4 O. S.	3·81	0 20
33	Amalner (Lon)	Linseed, 7th February 1891.	12	250	12	276 seed.	...	12 4 6	1 0 4 R. S.	8·31	0 20
	NÁSIK.										
	Mr. H. F. Silcock, Assistant Collector.										
34	Málegaon (Dayáne) ...	Linseed, 27th January 1891.	12	250	8½	215 seed.	...	10 6 3	1 5 10 O. S.	13·13	0 8
35	Do. do.	Do. ..	10	155	8½	155 seed.	...	7 3 10	1 11 2 O. S.	23·45	0 8
	AHMADNAGAR.										
	Mr. Sorábji Padamji, Assistant Collector.										
36	Kopargaon (Kokamthán) ...	Dry-crop wheat (Baksi) 10th March 1891.	12	500	48	675	450 chaff 1,400 straw.	25 7 6	1 5 2 R. S.	5·19	0 8
	Mr. R. B. Stewart, Assistant Collector.										
37	Nagar (Walki)	Jowári (Bedri) and Kardai 15th January 1891.	14	715	8½ jowári.	172	360 kadbi.	5 12 6	1 0 3 R. S.	17·10	0 8
				60	28 tolas kardai.	5	31 chaff.	0 2 6			
								5 15 0			
38	Párner (Narayen Gaváli) ...	Gram, 17th February 1891.	16	480	76	482	...	10 5 0	1 12 3 including water-rate. R. S.	17·12	0 8
	Mr. V. B. Vadekar, District Deputy Collector.										
39	Karjat (Kuldharan) ...	Jowári (Dagdi) and	16	825	4	664	2,080 kadbi 280 chaff.	18 12 0	0 5 11 R. S.	1·76	0 10
	POONA.	Kardai ...	16	90	1	96	112	2 4 0			
	Mr. E. L. Cappel, Assistant Collector.							21 0 0			
40	Khed (Kasba Khed) ...	Potato. 4th March 1891.	~~10~~	~~5,740~~ 4075	1,906	10,940 tubers; of these 6,920 best 2,800 seconds 1,220 thirds.	...	118 8 8	5 4 2 R. S.	4·43	0 4

Central Division, 1890-91.

R. S. = Revision Survey.

Equivalent in Tolás of local measure Ser.	Prices of Produce per Rupee. Grain.	Prices of Produce per Rupee. By-product.	Remarks.
13	14	15	16
	Lbs.	Cwts.	
143	29⅛	2¾	*Experiment No. 31* :—Partially irrigated wheat *bansi* on a first class black soil, growing jowári and cotton in rotation with wheat. Manured three years since with cowdung and ashes at 5 cart-loads the acre, and evidently in need of more. The owner paid Rs. 6-4-0 per acre for use of a well. This would have been a wise expenditure if a liberal application of manure had also been given.
114	17 1/16	...	*Experiment No. 32* :—Middle class soil, *baradi*, growing til after two years fallow. Unmanured and unirrigated. Cultivation fair and season good. Yield compared with the formulæ poor, but the incidence in column 11 low. Seed rate high, compared with the formulæ.
117	22½	...	*Experiment No. 33* :—Linseed on black soil, neither manured nor irrigated, growing in rotation cotton, jowári and linseed. Cultivation average and season fair. Compared with the formulæ yield low, but the incidence in column 11 not too high.
120	20¼	...	*Experiment Nos. 34 and 35* :—Good black soil, the cropping of which is regulated by the rainfall. If there is sufficient early rain, bájri is grown, if otherwise, the land is left for a rabi crop, which is usually jowári or linseed. This year's linseed unfavourably affected by irregular rainfall. These remarks apply to both experiments. Although the land in the 2nd experiment is of better quality than in the first, the yield is less because the seed was sown at a less favourable time.
120	21⅛	...	
117	33	1¼ chaff. 5 straw	*Experiment No. 36* :—*Bakshi* wheat grown on a red sandy soil locally called *Kevta* as a 2nd crop after bájri. This land also grows jowári, tobacco and garden crops. Season unfavourable. Crop slightly affected by blight, apparently due to high westerly winds. Ten tolas' difference between weight of sample ser, as found in this office and as recorded by experimenter.
125	58 jowári.	1¾ kadbi.	*Experiment No. 37* :—Jowári with kardai as subordinate crop on barad soil. Both practically a failure on account of scant rains, and land similarly cropped during the last five years. Incidence of assessment is necessarily high, and the local estimate in annas is reported ridiculously so.
...	32 kardai.		
114	47	...	*Experiment No. 38* :—Gram, irrigated from a well, grown as a 2nd crop after bájri on red land manured every 3rd or 4th year with 30 cart-loads ordinary manure. By-products not accounted for. Yield corresponds with formulæ. Seed rate very high. Incidence of assessment is calculated on the value of this crop alone. The previous bájri crop also grown this season not taken into account.
108	55⅛ jowári.	2¾	*Experiment No. 39* :—Mixed jowári and kardai on brown barad soil, assessed at nearly annas 6 per acre and growing this mixture nearly every year, linseed being occasionally taken as a subordinate crop. This test is taken in connection with a special experiment which is fully commented on in the Analysis. (*See* pages 15-16.)
85	43 1/10 kardai.	16	
Weight ser— 76	80 best 112 seconds 172 thirds.	...	*Experiment No. 40* :—Potatoes on good deep black—garden soil growing during the last four years, bájri as kharif and potatoes as cold weather crops. Land irrigated from a well and manured with cow-dung &c., 22 cart-loads per acre. Well water scant owing to deficient rainfall. By-products only useful as manure. Anna estimate probably too low and seed rate too high. The gross value of outturn satisfactory, and incidence of assessment very moderate.

Summary of Crop Experiment Reports,

O. S. = Original Survey;

No.	District, Ta'luka, Village and Experimenter.	Crop and date of Experiment.	Local Estimate in Annas.	Yield according to Formula.	Average per Acre.						Area of test.
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the Value of gross Produce.	
						Principal Product.	By-product.				
1	2	3	4	5	6	7	8	9	10	11	12
	POONA—*continued.*			Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.	A. g.
	Mr. S. R. Arthur, Assistant Collector.										
41	Indápur (Indápur)	Rabi, jowári (Málda ndi and dagdi), 19th January 1891.	16	1,120	3½	482	1,824 6 kadbi. 82 bhusa.	12 0 4	0 5 0 R. S.	2·60	0 10
42	Do. (Sansar)	Groundnut, 10th February 1891.	10	1,275	76⅝	1,172 nuts in shell.	...	27 13 10	0 4 4 R. S.	0·97	0 8
	Mr. J. W. Mollison, Superintendent of Farms.										
43	Haveli (Mundhwa)	Sugarcane, 28th January 1891.	18	5,400	2,383 canes, 6,498 lbs. nearly.	10,180 gul.	10,470 tops.	695 0 0	2 2 0 R. S.	0·30	0 4
	SHOLÁPUR.										
	Mr. W. Doderet, Assistant Collector.										
44	Sholápur (Vairag)	Groundnut, 12th February 1891.	17	3,400 nuts in shell.	125 clean nuts.	3,450 in shell. 2,507 shelled.	2,660	87 1 4	1 1 7 R. S.	1·26	0 4
	Mr. T. D. Fry, Assistant Collector.										
45	Mádha (Shetfal)	Groundnut, 7th February 1891.	16	3,200	97	2,540 nuts in shell.	4,200	66 7 4	0 13 3 R. S.	1·24	0 5
46	Málsiras (Málsiras)	Wheat (Jod), 5th March 1891.	11	630	75	915 in husk.	...	16 10 8	0 13 11 O. S.	5·21	0 5
	Mr. B. R. Heblikar, District Deputy Collector.										
47	Pandarpur (Shevate) ...	Rabi, jowári, 11th February 1891.	16	1,120	4½	340	840	7 8 0	0 11 1 R. S.	9·23	0 20
	SA'TA'RA.										
	Mr. G. D. Pánse, Assistant Collector.										
48	Válva (Peth)	Sugarcane. (Pandhra.)	18	5,400	16,000 sets.	11,312 gul.	...	757 1 4	3 10 2 O. S.	0·48	0 6
49	Do. do.	Groundnut, 21st January 1891.	17	3,400	...	4,124 nuts with shell.	...	103 1 9	1 14 7 O. S.	1·85	0 6
	Mr. G. W. Scott, District Deputy Collector.										
50	Khatáv (Katar Khatáv) ...	Groundnut, 13th February 1891.	16	3,200 nuts in shell.	93	3,873 nuts in shell.	788	86 12 4	2 9 6 R. S.	2·97	0 4

Central Division, 1890-91—continued.

R. S. = Revision Survey.

Equivalent in Tolás of local measure Ser.	Prices of Produce per Rupee.		Remarks.
	Grain.	By-product.	
13	14	15	16
	Lbs.	Cwts.	
101	67½	3¼ Kadbi.	*Experiment No. 41.*—Cold weather jowári on mixed soil assessed at a low rate and probably poor land. The yield of kadbi is satisfactory, but that of grain is much less than the anna estimate represents. The land was not ploughed this season, and was unmanured except from the droppings of grazing cattle. The incidence of assessment very low.
Weight. ser=80 Tolas.	51¼ nuts in shell.	...	*Experiment No. 42.*—Groundnut on poor black stoney land under irrigation from Nira Canal. Manured with 25 loads ashes, sweepings, &c., per acre. Crop being irrigated, was unaffected by character of season. Returns poor and less than corresponding formulæ.
Do. 78	15	5¼	*Experiment No. 43.—Pundya* or soft white sugarcane in a good black loamy soil, growing (1) sugarcane (2) ratoon and (3) fodder jowári in succession. The land fully and carefully irrigated from the Khadakvásla Canal and manured with poudrette (about 80 to 100 cart-loads per acre) mainly applied in January before the sets were planted. Actual yield nearly double the formulæ rate (5,400 lbs.) which may probably be due to the very liberal manure used and high class cultivation. Seed rate 5,000 canes according to formulæ. The value of tops included in column 9, but they are generally fed to cattle working the mill.
120	30½ shelled nuts.	4¼	*Experiment No. 44.*—Good black garden land commanded by two wells, growing on the area under experiment, sugarcane, jowári, chillies and groundnut. The land was liberally manured and the returns are correspondingly good. Incidence of assessment very low. The seed rate is high and is the only doubtful entry.
43	41 nuts in shell.	...	*Experiment No. 45.*—Groundnut watered from a well grown on alluvial land, a brown friable loam, overlying sand at a depth of 18 inches. Season favourable. Cultivation indifferent. No manure applied within the memory of occupier. Incidence of assessment slight and yield about average.
92	56¾ in husk.	...	*Experiment No. 46.*—Spelt wheat, irrigated, grown on friable black soil. Manured before seed time with 10 cart-loads dung and ashes per acre. Yield good for an eleven anna crop, but stated in husk not as clean grain. Incidence of assessment not high, considering this was a 2nd crop after jowári. By-product not weighed, but its value included in column 9.
144½	59	4¼	*Experiment No. 47.*—This crop is supposed to have been an average one of the district. The seed rate is lower than the corresponding formulæ. The yields of grain and fodder are both disappointing, and this is more remarkable, as the season is described as good.
Weight ser =78 Tolás.	16 gul.	...	*Experiment No. 48.*—High cultivation of sugarcane under well irrigation on a good black soil in the Krishna valley, growing garden crops such as sugarcane, tobacco and chillies. Manured at 15 cart-loads the acre. Season good, and yield excellent. By-product though useful as green fodder, was not weighed, but its average value included in column 9.
Do. 78.	40 nuts with shell.	...	*Experiment No. 49.*—Groundnut on an excellant black soil as above. Irrigated from a well and manured with cow-dung at 6 cart-loads and by folding 120 sheep per acre, for 5 days. Cultivation good, and season on the whole fair. Compared with formulæ for a 17 annas crop yield very high.
32	46 nuts in shell.	5¼	*Experiment No. 50.*—Groundnut on reddish soil, irrigated from a well, and manured this season with 12 cart-loads the acre. During previous three years a crop of bájri and two successive crops of jowári were grown. Yield good, but figures doubtful, as principal product was weighed immediately after being harvested while yet in a wet condition.

Summary of Crop Experiment Reports,

O. S.=Original Survey

No.	District, Ta'luka, Village and Experimenter.	Crop and date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.						Area of test
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the value of gross Produce.	
						Principal Product.	By-product.				
1	2	3	4	5	6	7	8	9	10	11	12
				Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.	A. g.
	BELGAUM.										
	Mr. W. D. Sheppard, Assistant Collector.										
51	Belgaum (Kudchi) ...	Rice (Antarsál), 27th November 1890.	16	1,600	27	1,615 in husk.	1,467	40 8 4 R. S.	4 12 11 R. S.	12·11	0 6
	Mr. J. H. Du Boulay, Assistant Collector.										
52	Gokák (Ankalagi)	Sugarcane (Rásdáll), March 1891.	13	3,720	1,500 sets.	4,847 gul.	...	358 14 0	2 6 0 R. S.	·66	0 4½
	BIJA'PUR.										
	Mr. N. G. Deshpande, District Deputy Collector.										
53	Bágevádi (Bágevádi) ...	Nigerseed .. February 1891.	7	80	½	55	...	1 10 3	0 5 9 R. S.	21·90	0 32
	DHA'RWA'R.										
	Mr. C. P. B. Wiltshire, Assistant Collector.										
54	Hubli (Keshavápur) ..	Jowári mixed with	12	470	3	729	2,845 kadbi, 132½ jowár bran.	22 0 1	2 15 0 R. S.	10·89	0 8
		green gram and	12	70	1½	66	272½ gram bran.	2 13 5			
		madki 23rd December 1890.	12	50	1½	60	272½ madki bran.	2 1 9			
								26 15 3			
55	Do. do ..	Do. ...	18	840	6	1,413	5,375 kadbi. 262½ jowári bran.	36 14 5	2 1 9 R. S.	5·57	0 8
		Do. ...	18	120	3	17	87½ gram bran	0 12 11			
		Do. ... 23rd December 1890.	18	90	3	2½	12½ madki bran.	0 1 8			
	Mr. R. E. Kanga, District Deputy Collector.							37 13 0			
56	Navalgund (Navalgund) ..	Jowári with	16	930	3½	1,020	1,560 kadbi, 164 bhusa,	28 2 8	1 5 0 R. S.	4·60	0 10
		green gram, 29th March 1891.	1	20	6½	12	44 mug chaff.	0 5 8			
								28 8 4			
57	Do do. ..	Jowári, 27th March 1891.	8	260	2½	321	670 kadbi. 48 bhusa.	9 14 10	1 5 0 R. S.	11·87	0 20
		Linseed 16th April 1891.	4	35	19½	22½	48 chaff.	1 2 0			
								10 0 10			

Southern Division, 1890-91.

R. S. = Revision Survey.

Equivalent in Tolás of local measure Ser.	Prices of Produce per Rupee. Grain	By-product.	Remarks.
13	14	15	16
	Lbs.	Cwt.	
63	44 in husk.	3⅜ Straw.	*Experiment No. 51*:—Unirrigated but manured rice *antarsál* on a black soil growing annually rice as kharif and lentils or gram as rabi crop. Cultivation indifferent; season good. The crop not raised from rabed or transplanted seedlings, but drilled by 6 coulter drill. Weight of straw less than weight of grain, probably not weighed. The incidence in column 11 calculated on the first or kharif crop only. Compared with Formulæ, 100 lbs. the acre the rate of seed very low.
19½ Weight Ser.	13⅛ Gul.	...	*Experiment No. 52*:—Rásdáli Khabbu—on a mixed soil irrigated by mot from a well and a nála and assessed at garden rates. Rotation sugarcane and navani. Manured at 50 cart-loads the acre before sowing. Cultivation good and season excellent. Compared with Formulæ, yield high. By-product not weighed, but its value included in column 9. Compared with formulæ, rate of seed apparently underestimated.
119	33	...	*Experiment No. 53*:—Nigerseed on an unmanured red soil, locally called 'Mardi'. Tillage good. Sowing rain not favourable, and subsequent breaks affected the crop. Yield poor. Weight per bushel; as well as gross yield much lessened by character of season.
144 Jowári.	52⅞	3⅜ kadbi.	*Experiment No. 54*:—Jowári mixed with green gram and madki, the two latter as subordinate row crops grown on black soil manured in June. The yield only middling and the incidence of assessment rather high. Probably a more liberal application of manure would have lowered it considerably. The season favourable for Jowári, but want of rain in September lessened the pulse yield.
151 Green gram.	41⅞	1⅛ jowári bran.	
		1⅛ gram bran.	
156 Madki.	51½	2⅜ Madkibran	
145 Jowári.	52⅞	5½ kadbi.	*Experiment No. 55*:—Better results in this than in the last test, although the land is assessed at a lower rate; double the amount of seed was sown in this case and the result appears to have been that the jowári smothered the subordinate crops; no doubt helped by the character of the season which was unfavourable to pulses.
150 Green gram.	41⅜	1⅛ Jowári bran.	
		1⅞ Gram bran.	
166½ Madki.	51½	2⅜ Madkibran	
153 Jowari.	51 jowári.	1½	*Experiment No. 56*:—Jowári and green gram on a black dry-crop soil growing in rotation 1 cotton, 2 wheat and safflower, and 3 jowári, linseed, gram or green gram. Cultivation good and season excellent for jowári. Compared with formulæ, jowári yield good, and though mug was utter failure, incidence in column 11 light. The value of manure applied 3 years ago counts for something in this test.
157½ Mug.	40½ Mug.	...	
149 Jowári.	49⅜	1½	*Experiment No. 57*:—Jowári with linseed on a similar soil under same conditions as above. Compared with experiment (No. 56) jowári in this experiment was poor from want of timely rain, and incidence in column 11 consequently high, linseed failing like mug in the above.
126 Linseed.	22⅜	...	

Summary of Crop Experiment Report,

O. S.=Original Survey;

No.	District, Ta'luka, village and Experimenter.	Crop and date of Experiment.	Local Estimate in Annas.	Yield according to Formulæ.	Average per Acre.						Area of test.
					Seed.	Yield of		Total Value of Produce.	Assessment, excluding Local Funds.	Incidence of Assessment on the value of gross Produce.	
						Principal Product.	By-product.				
1	2	3	4	5	6	7	8	9	10	11	12
				Lbs.	Lbs.	Lbs.	Lbs.	Rs. a. p.	Rs. a. p.	Per cent.	A. G.
	KOLA'BA. *Mr. E. M. Pratt, Assistant Collector.*										
58	Alibág (Khandale)... ...	Rice (Ghoṭle), 1st November 1890.	16	2,000	70	2,586 In husk.	3,680	59 5 0	6 8 10 O. S.	11·04	0 10
59	Do. do.	Rice (Garve Patni), 15th November 1890.	16	2,000	60	2,499 In husk.	3,536	59 3 0	6 15 6 O. S.	11·17	0 10
	RATNA'GIRI. *Mr. E. McCallum, Assistant Collector.*										
60	Dápoli (Vánoshi)	Harik, 10th November 1890.	18	720	27½	503	1,704	7 1 4	0 2 10 O. S.	2·52	0 6
61	Chiplun (Pimplikhurd)	Nachni, 17th November 1890.	16	640	38⅓	801	2,368	30 5 6	0 5 9 O. S.	1·18	0 6
	Mr. L. N. Ajgaonkar, District Deputy Collector.										
62	Rájápur (Kudewadi) ...	Nágli (mathala), and vari 1st November 1890.	17	680	12	723 Nágli 85 Vari.	905 Straw. 150 Vari straw.	18 6 2 1 15 8 20 5 10	0 7 3 O. S.	2·22	0 8
63	Do. do.	Nágli (Khandala), 1st November 1890.	18	720	12	1,390	1,125	34 4 4	0 6 2 O. S.	1·12	0 8
64	Rájápur (Lánje)	Do. 2nd November 1890.	19	760	12	1,650	2,275	44 9 9	0 6 5 O. S.	0·89	0 8
65	Do. do.	Varí, 5th November 1890.	18	720	5½	566	1,150	13 12 0	0 7 3 O. S.	3·29	0 8
66	Do. do.	Do. 6th November 1890.	16	640	5½	505	630	11 13 2	0 3 6 O. S.	1·85	0 8
67	Do. do.	Harik, 7th November 1890.	15	580	61	545	875	7 11 4	0 5 4 O. S.	4·32	0 8
68	Do. do.	Do. ...	16	640	61	656	950	8 12 10	0 6 7 O. S.	4·67	0 8
	KA'NARA. *Mr. C. W. Hudson, Assistant Collector.*										
69	Yellápur (Sabgiri)	Sugarcane (Dasali) 28th February to 3rd March 1891.	14	4,320 Gul.	20,671 Sets.	7,614 Gul.	16,670 Tops; 34,710 Sets.	390 11 8	4 0 0 O. S.	1·02	0 4
70	Supa (Gaveghali)	Hot weather or váiuan rice 17th & 18th May 1891.	13 to 16	...	207	2,220	50 Head loads	40 15 6	2 15 0 O. S.	7·17	0 4

Southern Division, 1890-91—continued.

R. S. = Revenue Survey.

Equivalent in Tolás of local measure Ser.	Prices of Produce per Rupee. Grain.	By-product.	Remarks.
13	14	15	16
	Lbs.	Cwts.	
26	52 in husk.	3 3/17	*Experiment Nos. 58 and 59* :—Good deep sweet rice land growing rice every year with a secondary pulse crop. Ample rainfall. The yield in No. 58 is better than in No. 59. Judging only from the conditions of cultivation the result should have been otherwise. In No. 59 the seed-bed was burnt with ráb of cowdung, leaves and grass, and the general area manured with fish manure. This is considered the best practice—certainly better than in No. 58 where the seed-bed only was manured with fish, and not burnt. Both crops were affected by grub. No. 59 more seriously than No. 58.
26½	50 in husk.	3 3/17	
46	75½	32	*Experiment No. 60* :—Harik after nágli on upland level land which was previously four years fallow, gave without manure a fair yield. The cultivation was good and season favourable. The experimenter values the straw at a very low rate as being useless as fodder; but its value for ráb or manure might have been taken into account.
55	33 11/13	3½	*Experiment No. 61* :—Nágli on varkas or sloping hill land gave capital return. It was the first crop taken after 5 years' fallow. The previous rotation was a slight modification of that commonly followed in the cultivation of the coarse hill millets. The season was favourable and although the tillage is not detailed it is described as good.
38½ Nágli.	41½	8½	*Experiment No. 62* :—Nágli muthla on an inferior stony or bharad soil growing after 5 years' fallow, 1 kulith, 2 harik and 3, nágli. This year vari was sown in rows. Manured at 40 heads the acre of dry cow and sheep dung after first showers and at sowing. Cultivation middling but season favourable.
37 vari.	43⅜		
39	42	8½	*Experiment No. 63* :—Khandála Nágli on an upland level soil locally called bhátli growing after 4 years' fallow kulith and nágli. Manured at 35 head loads of dry cowdung the acre. do. do.
36½	39	8½	*Experiment No. 64*— Do. First crop after 5 years' fallow. Rabed with leaves in April. do. do.
35½	43⅜	12½	*Experiment No. 65* :—Unrabed vari on a stony red or bharad soil growing after 4 years' fallow, 1 nágli 2 sarvat rice and (3) vari. Cultivation good and season favourable.
36½	44½	12½	*Experiment No. 66* :—Do. on an upland level bhátli soil growing after 3 years' fallow, 1 nágli, 2 harik, and 3 vari. Cultivation indifferent. Compared with the experiment above yield low, due to bad cultivation, but the incidence in column 11 light.
31½	77	12½	*Experiment No. 67* :—Soil stony upland usually left fallow for 10 years. Rotation 1 kulith, 2 nágli and 3 harik. Harik unrabed this year. Cultivation good, but the crop sufferred from insufficient late rains, purva rains being scant.
32⅝	80	12½	*Experiment No. 68* :—Soil rich upland level bhátli, cultivated after 5 years' fallow and growing nágli last year. Do. do. do.
...	21 Gul.	500 Sets.	*Experiment No. 69* :—Sugarcane on rice land with unusually efficient means of irrigation, *viz.*, an adjacent never failing stream. Cultivation good, season average. Gross value of yield shows better returns than that represented by local estimation—14 annas. Ash of crushed cane and burnt leaves applied as manure with a subsequent heavy dressing of cow-dung. Tops not valued and some corrections made in experimenter's figures. 20,670 sets (value Rs. 41-5-6) not accounted for in column 9 being required for seed next season, and consequently not sold by the owner.
85⅝	63⅞	...	*Experiment No. 70* :—Hot weather or váingan rice grown on a rich soil growing kharif and hot weather rice, irrigated from a nála and liberally manured. Cultivation good and season favourable. Yield good and incidence in column 11 though on a second crop, light.

APPENDIX.

Note on sugarcane cultivation at Mundhwa, Táluka Haveli.

The most suitable soil is a deep dark loam locally called *Madhyam Káli*, overlying a light coloured clay. The plastic and retentive character of this subsoil is modified by a considerable admixture of pebbles. For such land a rent of Rs. 25 to 40 per acre is charged by the superior holder, while the Government assessment averages about Rs. 2 per acre. The Khadakvásla canal affords ample facilities for irrigation. Irregular irrigation spoils the quality of the crop by causing splitting and hollowness in the cane. The land is first flooded as the "sets" are being planted and thereafter two or three times at short intervals to encourage the "eyes" to shoot; subsequently 8 to 10 days may elapse between waterings, but the soil must be kept continuously moist. Even in the rains irrigation is required. The rainfall at Mundhwa averages 31 inches.

Sugarcane is a 12 months crop, and during the period of growth water will be laid on about 48 times. One man at Rs. 8 per month can irrigate four acres during the year. Thus the cost per acre is Rs. 24, which, with the special water-rate of 50 rupees an acre, makes the total cost of irrigating an acre of cane 74 rupees.

Cane would be grown continuously if it were found practicable. Ratoon cane is found to pay only as far as the 2nd, sometimes the 3rd year. The more common rotations are: 1st cane, 2nd ratoon, 3rd jowári (fodder); or 1st cane, 2nd ratoon, 3rd ratoon, 4th jowári (fodder).

One practical objection to continuing ratoon beyond the above period is this. The roots or "stools" become over-grown so much that the water-courses are obstructed, and there is a difficulty in irrigating equally or sufficiently. There is another objection, the old stumps do not shoot up new cane nearly so quickly as "sets" do and especially so when the weather is cold.

The cane commonly grown is *Pundya*, a tall white, soft variety liable to considerable damage on account of its softness from the attacks of jackals and pigs. As already noted, it is a 12 months crop usually planted in February and March. Nothing definite can be stated as to the exact age at which cane will yield the greatest percentage of gul. It is admitted that if allowed to stand more than a year, the percentage of sugar is increased and this is peculiarly the case with ratoon, which, although the previous crop may have been cut early in February, does not begin to grow until the hot weather. The cultivator is influenced in fixing the time of harvest by the appearance of the cane. If the upper green leaves have completely unfurled and attained their full length and there be no further indication of young leaves growing from the bud axis, then the crop is ripe and can be harvested.

In the statements appended hereto, in addition to actual cultivation charges, I make a very liberal allowance to cover cost of maintenance of machinery and interest on invested capital. The profits shown are not large. This is due to the low price of gul at the time of the experiment. The market has, however, since recovered, and Rs. 19 for 240 lbs. may be taken as the average price for the season.

The enormously high rent charges at Mundhwa preclude the possibility of fodder jowári being by itself a paying crop. It is grown because one year must elapse between the removal of old ratoon and replanting with cane. Sometimes, when the land is weedy, the cultivator prefers to sow *san* (Crotalaria juncia) instead: 72 lbs. seed per acre sown broadcast in June—July produces a crop, which in the course of two months attains a height of 2½ to 3 feet, which is then ploughed in as green manure. This crop also smothers surface weeds.

The question of manures is an important one; sometimes the required quantity costs as much as Rs. 300 per acre. A dressing of mhowra refuse from the distillery yields an equally good crop with poudrette, but the quality of gul is inferior.

Poudrette, farm-yard manure, town sweepings and castor cake-from Gujarát are extensively used. Cake is not used alone, but as a second dressing, half the usual quantity of poudrette being applied in January before the sets are planted and 6,000 lbs. per acre of castor-cake, costing Rs. 75 at Poona applied in June—July.

Eighty to 100 cart-loads of poudrette, farm-yard manure or distillery refuse is no uncommon dressing. These quantities are valued at Rs. 250 to Rs. 300 per acre and extravagant though the expenditure appears, it has been found to pay well.

In my experiment I found that an acre of good cane when ripe weighed approximately 45 tons. The gul per acre from this crop weighed 10,180 lbs. Tops of cane weighing about 4½ tons per acre are fed as fodder.

The land is deeply ploughed in November with a large eight-bullock plough, an acre being covered in about 4½ days. The soil is turned up in huge clods and is allowed to weather before it is cross ploughed. One or two subsequent ploughings during December improve the tilth considerably, most of the clods crumble into small pieces, while the soil becomes friable and easily moved to a depth of 8 or 10 inches. The surface is now levelled with a log harrow and manure applied. Poudrette or dung or distillery refuse is deposited in heaps regularly over the field—three or four heaps from one cart-load. These are evenly and carefully spread. The land is now ridged up with a plough. The ridges are 24″ to 28″ apart. The field is finally laid out in beds 10 feet square. This is done with the *kudali* or handhoe by cutting water-courses across the line of ridges. The field is now in a condition to be planted. This operation proceeds very methodically. The cane of a standing crop is stripped, topped and cut into "sets." These sets vary in length. Each set must have three nodes or eyes, so that the sets cut from the top end of the cane are longer than those cut from the base. One acre of good cane will furnish sets sufficient to plant 12 acres. The sets are carried in head loads to the fields to be planted and laid along the ridges. Water is turned into each bed in turn. The planter begins to lay the sets carefully in the bottom of the furrows tramping each set down into the mud with his foot as he proceeds. The distance between sets is about four inches.

I may here notice that sometimes all the manure is carried in headloads and applied directly to the furrows after the beds are formed and before the sets are planted.

Planting should be done, if possible, in February and finished by the middle of March. A month after planting, the land is carefully weeded with a hand-spade and the operation repeated as often as is necessary, until the cane shades the soil. Usually four weedings are required. In June—July new beds are formed. The soil is dug and levelled and all weeds removed. A second dressing of manure may be applied at this time. The cane originally planted in the furrows is now earthed up with a handhoe, so that new water-courses are formed; no further attention is required except careful irrigation until the crop is ripe. The harvesting of the crop and manufacture of gul is done by contract. Professional sugar-boilers undertake to do the whole work. They are paid at the rate of Rs. 15 for 2,400 lbs. of jagri made. They are provided with all necessary machinery and plant, also fuel and lubricating oil. They are allowed the cane tops as fodder for the bullocks which they provide to work the cane mills. The crushed cane and withered leaves stripped from the cane are found to furnish sufficient fuel.

The following results were obtained from a carefully measured 4 guntha patch of good cane cut and converted into gul according to the ordinary process :—

Number of canes	... 2,860
Weight of canes	... 7,798 lbs.
Weight of tops	... 1,047 lbs.
Weight of expressed juice	... 5,540 lbs.
Percentage of juice to cane	... 71 per cent.

Weight of gul	1,018 lbs.
Percentage of gul to juice	18·37
Percentage of gul to cane	13·05
Total value of gul *per acre* at present market value Rs. ...	678

The appended statements as to cost and methods of cultivating new and ratoon cane and jowári are sufficiently explanatory without any further narrative.

Statements showing cost of production and value of produce.

I.—New Cane after Jowári.

	Per acre. Rs.	a.	p.
First ploughing in November (4 team plough does an acre in 4½ days)	11	0	0
2nd and 3rd ploughings in December; cost of 2 ploughings...	16	0	0
Levelling with harrow and crushing clods	2	0	0
Manure 80 cart-loads poudrette ... ... Rs. 160			
Cartage and spreading ... ... „ 80			
	240	0	0
Ridging of land	3	0	0
Making water-channels and beds (10 feet square) ...	2	0	0
Value of "sets" (1 acre of good cane will yield sets for 12 acres)	50	0	0
Cost of cutting cane and planting sets	10	0	0
Watering (48 waterings in a year, one man can sufficiently irrigate four acres and is paid Rs. 8 per month) ...	24	0	0
Weeding (4 weedings in a year, 1st a month after ploughing, last in May—June)	18	0	0
Digging and making new beds in July	10	0	0
Water-rate	50	0	0
Rent	25	12	0
Assessment	2	2	0
Cost of harvesting and making gul	63	0	0
Wear and tear of machinery	11	0	0
Interest on invested capital at 7 per cent.	37	9	0
Total ...	575	7	0
Value of crop (10,180 lbs. gul per acre)	678	0	0
Add—Value of ashes to be returned as manure... ...	15	0	0
Total ...	693	0	0
Profit per acre ...	117	9	0

II.—Ratoon Cane.

Clearing of rubbish of previous crop	5	0	0
Weeding four times (1st in February, last in June) ...	25	0	0
Digging and levelling in June	8	0	0
Manure ... ... Rs. 160			
Manuring (June) and cartage (Manure carried in headloads)... ... ... „ 80			
	240	0	0
Extra cost of applying manure	10	0	0
Making new beds and ridging up	10	0	0
Watering, including water-rate	74	0	0
Rent and assessment	27	0	0
Harvesting and making gul	47	0	0
Wear and tear of machinery	11	0	0
Interest on invested Capital at 7 per cent.	32	0	0
Total cost per acre ...	489	0	0
Value of produce (7,600 lbs. gul at Rs. 16 per 240 lbs.) ...	507	0	0
Add—Value of ashes to be returned as manure	15	0	0
Total Value of crop per acre ...	522	0	0
Profit per acre ...	33	0	0

III.—Fodder Jowári after Ratoon.

	Rs.	a.	p.
Digging cane stumps (Poor people are allowed to carry away stumps for fuel)	5	0	0
Ploughed once in March...	12	0	0
Four harrowings at intervals of 8 to 10 days (April—May) .	4	0	0
Drilling and harrowing (June—July)	2	8	0
Cost of seeds 48 sers (rows 10" apart)	6	0	0
Hoeing in August	1	0	0
Harvesting and tying up in bundles in October	7	0	0
Rent and assessment	27	0	0
Interest on invested Capital	4	8	0
Total cost per acre ...	69	0	0
Value of estimated average produce (900 bundles at Rs. 6 per 100)	54	0	0
Loss per acre	15	0	0

Boiling process.

The making of jágri is in the hands of professional boilers, who are very reserved as to the secrets of their craft. At Mundhwa the pans used are made of iron, and are of the wide and shallow pattern. The most usual dimensions are diameter 6½ feet, depth about 7 inches. The evaporating pan fits neatly in to the top of a mud oven or furnace, and, as far as I can judge, the whole secret of making good jágri depends upon maintaining an equal and proper degree of heat throughout the evaporating process. Each day before the first boiling the pan has to be thoroughly cleaned and coated with oil or grease. This is to prevent burning. It need only be repeated when the work has been stopped for some hours and the remnant of a previous boiling has been allowed to harden and adhere to the pan.

The amount of juice required for one "charge" weighs about 736 lbs. I found that the time occupied in boiling this quantity down to the desired consistency was nearly constant and averages two hours and twenty-three minutes. At no time is the juice allowed to boil very vigorously. Skimming is done with a wicker ladle, which is also used to agitate the syrup when the fire is too hasty. As the mass thickens it changes to a yellow brown colour. It now heaves rather than bubbles and has to be kept in continual motion with a wooden hoe. At this time repeated trials are made to test whether the syrup has approached the granular state. This is done by dropping a little into cold water and noting if it quickly hardens. If it does so evaporation is complete. The pan is now removed from the furnace and the contents emptied into another pan. As the jágri hardens it is placed in a coarse cloth which lines a cylindrical hole in the ground and there is allowed to "set" into a "sugar-loaf" weighing about 140 lbs., which is removed next day.

Expressing juice from cane.

In testing the capabilities of Subráo's 3-roller mill (The Poona-made mill in ordinary use and most forward at Mundhwa) I found that it took 42 minutes to express 72·61 per cent. of juice from 504 lbs. of cane. These are unusually good results and obtained at a time when those working wished to show the full capacity of the mill; working in the ordinary manner and allowing for all stoppages and basing my calculations on the work actually done in ten hours, I found that cane was crushed at the rate of 458 lbs. each hour and the percentage of juice to cane was 71.

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